8.

DRAFT

CITY OF MILPITAS

Stormwater C.3. Guidebook

Stormwater C.3. Guidebook

C.3. Guidebook Committee

Fariborz Heydari
Tambri Heyden
Annelise Judd
Mehdi Khaila
Marilyn Nickel
Paramjit Uppal
Robert Wang
Darryl Wong

with assistance from
Dan Cloak Environmental Consulting
www.dancloak.com

DRAFT D8
MAY 9, 2003

Table of Contents

Tables

BMP Gallery

Checklists

Glossary

Best Management Practice (BMP) Any procedure or device designed to minimize the quantity of pollutants that enter the storm drain system. See Chapter Two for a discussion of the various types of BMPs.

C.3 Provisions, added in November 2001, of the Regional Water Quality Control Board's (see) stormwater NPDES permit (see). Requires Milpitas to change its development review process to control the flow of stormwater and stormwater pollutants from new development sites. RWQCB Order 01-119.

California BMP Method A method for determining the volume of treatment BMPs. Described in Appendix D of the California Stormwater Best Management Practice Manual (Municipal) (SWQTF, 1993).

Compensatory Mitigation Treatment of an equivalent pollutant loading or quantity of stormwater runoff or other equivalent water quality benefit, created where no other requirement for treatment exists, in lieu of on-site treatment BMPs.

Conditions of Approval (COAs) Requirements the City may adopt for a project in connection with a discretionary action (e.g., adoption of an EIR or negative declaration or issuance of a use permit). COAs may include features to be incorporated into the final plans for the project and may also specify uses, activities, and operational measures that must be observed over the life of the project.

Design Storm A synthetic rainstorm defined by rainfall intensities and durations. See Chapter Two.

Detention The practice of holding stormwater runoff in ponds, vaults, within berms, or in depressed areas and letting it discharge slowly to the storm drain system. See **infiltration** and **retention**.

Drawdown time The time required for a stormwater detention or infiltration BMP to drain and return to the dry-weather condition. For detention BMPs, drawdown time is a function of basin volume and outlet orifice size. For infiltration BMPs, drawdown time is a function of basin volume and infiltration rate.

Exemption Exemption from the requirement to provide **compensatory mitigation** may be allowed for projects that meet certain criteria set by the RWQCB. These projects must, however, show **impracticability** of on-site treatment BMPs and also show that the costs of compensatory mitigation would place an "undue burden" on the project.

Head In hydraulics, energy represented as a difference in elevation. In slow-flowing open systems, the difference in water surface elevation, e.g., between an inlet and outlet.

Hydromodification Management Plan (HMP)
Required by the C.3 provisions to the stormwater NPDES permit, the HMP must be submitted by October 15, 2003. The HMP, once approved by the RWQCB, will be implemented so that post-project runoff shall not exceed estimated pre-project rates and/or durations, where the exceedance would result in increased potential for erosion or other adverse impacts to beneficial uses.

Impracticable
As applied to on-site treatment BMPs, technically **infeasible** or excessively costly, as demonstrated by set criteria.

Infeasible
As applied to on-site treatment BMPs, impossible to implement because of technical constraints specific to the site.

Infiltration
Seepage of runoff through the soil to mix with groundwater. See **retention.**

Intensity-duration-frequency (IDF)
An adjunct to the rational method (see), IDF allows calculation of the governing rainfall intensity based on the estimated time required for runoff flows from the farthest point of a drainage area to reach the point where peak flows are to be determined.

Low Impact Development
Low Impact Development is an integrated site design methodology that uses small-scale detention and retention to replicate pre-existing site hydrological conditions.

Maximum Extent Practicable (MEP)
Standard, established by the 1987 amendments to the Clean Water Act, for the implementation of municipal stormwater pollution prevention programs. See Chapter Two.

National Pollutant Discharge Elimination System (NPDES)
As part of the 1972 Clean Water Act, Congress established the NPDES permitting system to regulate the discharge of pollutants from municipal sewers and industries. The NPDES was expanded in 1987 to incorporate permits for stormwater discharges as well.

Nomograph
A chart that aids engineering calculations by representing the relationship among three variables. Nomographs in the California BMP Handbooks represent the relationship among percent annual capture, watershed imperviousness, and unit water quality volume.

Numeric Criteria
Sizing requirements for stormwater treatment BMPs established in Provision C.3.d. of the RWQCB's stormwater NPDES permit.

Permeable Pavements
Pavements for roadways, sidewalks, or plazas that are designed to infiltrate runoff, including pervious concrete, pervious asphalt, unit-pavers-on-sand, and crushed gravel.

Percentile Rainfall Intensity
A method of determining design rainfall intensity based on a ranking of storms, over a long period, by rainfall intensity and selection of a percentile.

Planned Unit Development (PUD) Allows land to be developed in a manner that does not conform to existing zoning requirements. Allows greater flexibility and innovation because the PUD is regulated as one unit instead of each lot being regulated separately.

Rational Method A method of calculating runoff flows based on the ratio of pervious and impervious areas, rainfall intensity, and tributary area.

Regional (or Watershed) Stormwater Treatment Facility A facility that treats runoff from more than one project or parcel. Participation in a regional facility may be in lieu of on-site treatment controls, subject to the requirements of NPDES permit provision C.3.g.

Regional Water Quality Control Board (RWQCB) One of nine California RWQCBs, the RWQCB for the San Francisco Bay Region is responsible for implementing pollution control provisions of the Clean Water Act and California Water Code within the area that drains to San Francisco Bay.

Retention The practice of holding stormwater in ponds or basins and allowing it to slowly infiltrate to groundwater. See **infiltration** and **detention**.

Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) SCVURPPP is established by a memorandum of understanding among 13 Santa Clara Valley cities and towns, Santa Clara County, and the Santa Clara Valley Water District, who are listed as Co-permittees in an NPDES stormwater discharge permit issued by the Regional Water Quality Control Board. SCVURPPP implements common tasks and assists the member agencies to implement their local stormwater pollution prevention programs.

Stormwater Control Plan A plan specifying and documenting permanent site features and BMPs that are designed to control pollutants for the life of the project.

Stormwater Control Operation & Maintenance Plan A plan detailing operation and maintenance requirements for stormwater treatment BMPs incorporated into a project. An acceptable Stormwater Control Operation and Maintenance Plan must be submitted before the building permit is made final and a Certificate of Occupancy is issued.

Stormwater NPDES Permit The permit issued to 13 Santa Clara Basin cities and towns, Santa Clara County, and the Santa Clara Valley Water District by the Regional Water Quality Control Board for the San Francisco Bay Region. Order 01-024. Order 01-119 amended Provision C.3 of the permit.

Storm Water Pollution Prevention Plan (SWPPP) A plan providing for temporary measures to control sediment and other pollutants during construction.

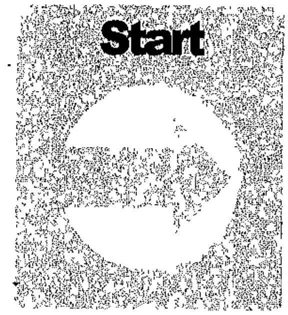
Urban Runoff Pollution Prevention Program Also Stormwater Pollution Prevention Program. A comprehensive program of activities designed to minimize the quantity of pollutants entering storm drains. See Chapter One.

WEF Method

A method for determining the required volume of treatment BMPs, recommended by the Water Environment Federation and American Society of Civil Engineers. Described in *Urban Runoff Quality Management* (WEF/ASCE, 1993).

Water Quality Volume (WQV)

For BMPs that depend on detention to work, the volume of water that must be detained to achieve maximum extent practicable pollutant removal. This volume of water must be detained for a specified drawdown time.



How to Use this Guidebook

Read the Overview to get a general understanding of the requirements. Then follow the step-by-step instructions to prepare your Stormwater Control Plan.

THIS *Guidebook* will help you insure that your project complies with the Regional Water Quality Control Board's C.3. requirements. Because the requirements are complex, and because every project is different, you may want to begin by scheduling a **pre-application meeting** with City staff. At this meeting, you can ask how the C.3. requirements, and other planning and zoning requirements, apply to your project.

To use the *Guidebook,* Start by reviewing **Chapter One**, which provides a brief overview and explanation of the new requirements to control runoff from new development projects. The overview covers regulations, the plan review process, design issues, and the environmental benefits the regulations are intended to achieve.

If there are terms and issues you find puzzling, try finding answers in the glossary or in **Chapter Two**. Chapter Two consists of some one-page summaries of key concepts like "maximum extent practicable," infiltration and groundwater protection, and design storm.

ICON KEY
Helpful Tip
Submittal Requirement
Terms to Look Up
References & Resources

Then proceed to **Chapter Three** and follow the step-by-step guidance to prepare a Stormwater Control Plan for your site.

If your project requires CEQA review, **Chapter Four** will tell you how to integrate analysis of stormwater impacts and mitigations into your documentation.

Design requirements are provided in **Chapter Five**, along with references that will aid you in designing the features you've identified in your Stormwater Control Plan. Chapter Five also includes designs, and a simplified design procedure, for stormwater BMPs.

Chapter Six summarizes some of the anticipated maintenance requirements for treatment BMPs.

Chapter Seven identifies some options for treating runoff downstream from your site, or for providing compensatory mitigation on a different site.

Throughout each Chapter, you'll find references and resources to help you understand the regulations, complete your Stormwater Control Plan, and design stormwater control measures into your project.

If you are reading this *Guidebook* online – on the City of Milpitas website or using a compact disc available from the City – you can use hyperlinks to access various references. The hyperlinks are throughout the document, as well as in "References and Resources" sections marked by the 🕮 icon. Some references are on the CD and City of Milpitas website; others are located at the websites of other organizations. Some of these latter links (URLs) may be outdated. In this case, you might try entering portions of the title or other relevant keywords into an internet search engine.

Chapter 1

Overview

For a broad-based understanding, look at the Stormwater C.3. requirements from four different perspectives: as water-quality regulations, as planning requirements, as a design challenge, and as a way to obtain environmental benefits for the community.

State and Federal Regulatory Perspective

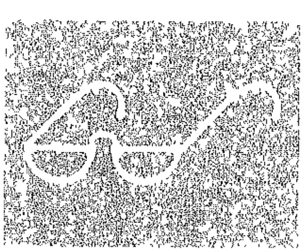
The California Regional Water Quality Control Board for the San Francisco Bay Region (RWQCB) has mandated that the City of Milpitas impose new, more stringent requirements to control runoff from development projects.

The RWQCB amended **Provision C.3.** of the City's stormwater discharge permit in October 2001. The City is phasing in the requirements in from 2002 through 2004.

The RWQCB has determined that the new Provision C.3. requirements are needed to implement Federal Clean Water Act provisions governing discharges from municipal storm drains.

Clean Water Act
Regulations on stormwater discharges have grown progressively more stringent since the Clean Water Act was amended in 1987.

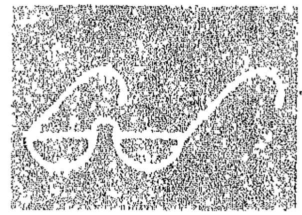
Congress adopted amendments to the Clean Water Act in 1987, and the United States Environmental Protection Agency (USEPA) issued implementing regulations in 1990. That same year, the RWQCB first issued an initial stormwater discharge permit to Milpitas, 12 other South Bay cities and towns, the County of Santa Clara, and the Santa Clara Valley Water District.



Since the early 1990s, Milpitas has required contractors to implement **temporary Best Management Practices (BMPs)** to minimize the amount of sediment and other pollutants that enter site runoff during construction. For several years, Milpitas has also encouraged applicants to design their projects to minimize new impervious area and to incorporate into their plans **permanent treatment BMPs** – features and devices that detain, retain, or treat runoff for the life of the project.

"Maximum Extent Practicable"
For more on this and other stormwater terms, see the Glossary and discussions in Chapter Two.

As before, the standard for these BMPs is "maximum extent practicable," or MEP. However, the new permit requirements define MEP more specifically and include design criteria.



The new development provisions are one part of the City's **comprehensive urban runoff pollution prevention program.** That program also requires:

- Controls on runoff from existing commercial and industrial sites.
- Temporary measures to control sediment and other pollutants in runoff from construction sites.
- Changes in the way the City maintains streets, parks and public infrastructure.
- Prevention of illegal dumping in storm drains.
- Public outreach and education.

ICON KEY
Helpful Tip
Submittal Requirement
Terms to Look Up
References & Resources

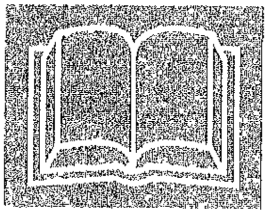
Under the RWQCB stormwater discharge permit, South Bay cities and other agencies implement some activities individually. Other activities are done jointly through the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).

RWQCB staff monitors the City's implementation of permit requirements. The City must report on its development review process, number and type of projects reviewed, and what runoff control measures were included in the projects.

As required by Permit Provision C.3.f., SCVURPPP is working with the Santa Clara Valley Water District on a **Hydromodification Management Plan (HMP).** The HMP will identify areas where runoff due to development increases the likelihood of erosion and other impacts to streams. In these areas, the RWQCB intends that post-project runoff flow and volume will not exceed pre-project rates or durations. In these areas, projects will need to meet requirements for flow control in addition to requirements for treatment of stormwater.

Once the RWQCB approves the HMP, the City of Milpitas will identify the portions of the City where it applies and will make clear the requirements and documentation for projects in these areas.

In the meantime, while the HMP is being drafted and reviewed, project applicants are encouraged to use "dual-purpose" designs. These designs control pollutants and reduce runoff quantities by minimizing imperviousness and by slowing, retaining, and detaining runoff flows. The design approach recommended in Chapter Five achieves "dual purpose" by distributing small detention areas throughout the site, increasing the time it takes for runoff to reach storm drains.



References and Resources

- RWQCB Order No. 01-119 (Stormwater NPDES Permit Amendments)
- RWQCB Order 01-024 (Stormwater NPDES Permit)
- RWQCB Fact Sheet on New Development Provisions
- RWQCB Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan)
- Clean Water Act Section 402(p)
- 40 CFR 122.26(d)(2)(iv)(A)(2) – Stormwater Regulations for New Development
- SCVURPPP – Urban Runoff Management Plan (1997)
- City of Milpitas Urban Runoff Management Plan
- Hydromodification Management Plan Literature Review
- Hydromodification Management Plan Workplan

Local Development Review Perspective

The City of Milpitas created this Guidebook to help project applicants implement the stormwater permit provision C.3 requirements. City staff aims to make these complex requirements clear and easy to follow. City staff will work with project applicants to facilitate timely and complete review of their projects.

The process for reviewing stormwater controls is integrated with the City's other development review procedures. There are two phases: The first is **planning and zoning review**; the second is the **plan check process.**

Threshold

A Stormwater Control Plan will be required for projects that create more than one acre of new impervious area.

The RWQCB's C.3 requirements apply to projects above the **thresholds** stated in the permit. For previously undeveloped sites, the C.3 requirements apply if a project creates more than one acre of new impervious area.

For sites over one acre that have been previously developed, the threshold is a bit more complex. If the new project results in an increase of, or replacement of, more than 50% of the previously existing impervious surface, and the existing development was not subject to stormwater treatment measures, then the entire project must be included in the treatment measure design. If less than 50% of the previously impervious surface is to be affected, only that portion must be included in the design. Interior remodels, routine maintenance or repair, roof or exterior surface replacement, and repaving are not subject to C.3 requirements. [1]

[1] This summary is for information only. For application to a specific project, consult the RWQCB Order and discuss with City staff.

The threshold changes to 5000 square feet[2] of impervious area for applications deemed complete on October 15, 2004 or later.

If the C.3 requirements apply, Planning Division staff will require that a Stormwater Control Plan be submitted along with the Planning and Zoning application. This should be discussed at the pre-application meeting.

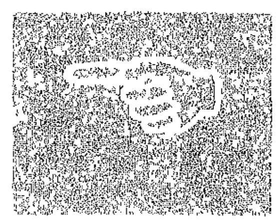
CEQA

See Chapter Four for a discussion of how to document stormwater impacts and mitigations in Initial Studies and Environmental Impact Reports.

If the project requires review under the California Environmental Quality Act (CEQA), Planning Staff will require submittal of an **Environmental Information Form.** This submittal should document potential impacts of the project's changes to stormwater runoff. Staff will use an initial study checklist to determine whether the project may still have significant effects on the environment after proposed mitigation measures are included. Stormwater impacts can be mitigated by minimizing site imperviousness, controlling pollutant sources, and incorporating **treatment BMPs** that retain, detain, or treat runoff.

The Planning Department or Planning Commission (or in some cases, the City Council) will approve or deny the application. If the application is approved, the Planning Department, Planning Commission, or City Council will attach conditions of approval, which will include requirements for stormwater controls.

The second phase of development review is the **plan check process.** City staff will examine the construction plans for the project to insure that the plans comply with applicable building codes and the approved special conditions. During this phase, City staff will check that the required stormwater controls are incorporated into the plans, that the stormwater controls meet specified design criteria, and that their construction will comply with applicable building codes.



Architects and engineers should prepare a stormwater control plan simultaneously with the site plan and landscaping plan.

By doing so, they will:

- Maximize multiple benefits of site landscaping.
- Reduce overall project costs.
- Improve site aesthetics and produce a better quality project.
- Be more likely to achieve "maximum extent practicable."

---

[2] Pending a possible alternative criterion to be proposed by the City and reviewed by the RWQCB. To be consistent with the requirements of more recent NPDES permits issued to cities in neighboring counties, the threshold may be revised to 10,000 square feet of impervious area.

TABLE 1-1. A SWPPP and a Stormwater Control Plan are two separate documents.

	Storm Water Pollution Prevention Plan (SWPPP)	*Stormwater Control Plan*
Primary objective	Minimize potential runoff pollution during construction.	Minimize potential runoff pollution for the life of the project.
Pollutants targeted	Sediment from erosion and site disturbance, maintenance of construction equipment, construction activities (e.g. painting).	Pollutants deposited in airborne dust, liquids and dust from automobiles, cleaning solutions (e.g. from food service), litter and trash.
Coordination with review process	Submitted with application for building permit.	Submitted with application for planning and zoning review.
Coordination with project planning	Coordinated with grading plans and construction scheduling and phasing.	Integrated with site plan, drainage plan, and landscaping.

- Speed project review.
- Avoid unnecessary redesign.

A Stormwater Control Plan is a separate document from the Storm Water Pollution Prevention Plan (SWPPP). The SWPPP provides for temporary measures to control sediment and other pollutants during construction. The Stormwater Control Plan specifies permanent controls that should last for the life of the project. In some cases, the two plans need to be coordinated. For example, at the end of the construction phase, a basin used for temporary sediment control could be converted to a permanent swale, basin, or bioretention area. The basin would be shown in the SWPPP and in the Stormwater Control Plan.

Preparing a Stormwater Control Plan involves the following steps:

1. Assemble needed information.
2. Identify constraints and opportunities.
3. Design to minimize imperviousness.
4. Locate and select treatment BMPs.
5. Perform preliminary design of BMPs.

6. Specify source controls.

7. Integrate with other preliminary drawings.

8. Identify permitting and code compliance issues.

9. Identify BMP maintenance requirements.

10. Complete a Stormwater Control Plan & Report.

Chapter Three helps guide you through each step. **Chapter Four** includes information on how to document stormwater potential impacts and mitigations in CEQA documentation.

References and Resources:

- RWQCB Order No. 01-119 (Stormwater NPDES Permit Amendments) Provisions C.3.(b) and C.3.(j)
- California Planning and Zoning Law
- California Environmental Quality Act
- *CEQA Deskbook 1999 [Second] Edition* (Bass, Herson, and Bodan, Solano Press Books, 2001)
- SCVURPPP – Model Performance Standard for New Development Planning Procedures
- City of Milpitas Development Review Application Form
- City of Milpitas Environmental Information Form
- City of Milpitas Initial Study Checklist
- California Building Code
- *California Stormwater Best Management Practice Handbook (Construction)*
- *Manual of Standards for Erosion and Sediment Control Measures* (Association of Bay Area Governments, 1998)

Planning and Design Perspective

In most cases, stormwater controls will add to the overall cost of a project. Stormwater controls may also constrain use of the site.

However, if executed well, and if integrated with landscaping and site amenities, stormwater controls can **add to your project's quality and value.**

Design Objective
Make the site mimic, as much as possible, the way a natural landscape drains.

From a site design perspective, the aim of stormwater controls is to make site drainage mimic, as much as possible, the way a natural landscape drains.

Much of the rain falling on a natural landscape is held by vegetation, soaks into the soil, or seeps slowly downhill. Pollutants washed out from the atmosphere are absorbed through contact with soils and vegetation.

Roofs and paving prevent rain from reaching the soil. Pollutants wash off the impervious surfaces, and drain pipes transport the runoff rapidly and efficiently. Higher peak flows and runoff volumes promote channel erosion – unless streambanks are hardened.

Because most rainfall comes in small storms – and because small storms have cumulative and profound effects on stream channel stability – it makes sense to **design stormwater controls to detain, retain, and treat runoff from small storms**. In Milpitas, about 85% of average annual rainfall comes in storms of around one inch or less.

An obvious, and effective, way to limit site runoff is to **minimize the amount of pavement and roofs**. Some paved areas can be designed with unit pavers, gravel, or other pervious surfaces. Runoff from small paved areas, like sidewalk or driveway strips, can be sloped to drain to concave lawns or landscaping.

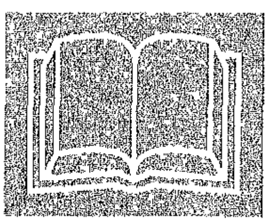
Runoff collected from larger impervious areas, like roofs or parking lots, can be channeled through features located in depressions and integrated into the landscape. These features include swales, infiltration/detention basins, and bioretention areas.

These **treatment BMPs** can help infiltrate runoff into the soil. If soils are impermeable or groundwater is too close to the surface – as in parts of Milpitas – the features can detain and treat runoff before it is allowed to slowly drain away.

Where space and site layout do not allow swales, basins, or bioretention areas, it is still possible to use vaults for storage and sand filters for treatment. These devices work, but are more expensive, require more maintenance, and generally do not contribute to site aesthetics.

Projects in the Bay Area, throughout the U.S., and in other countries have successfully implemented these techniques. Design manuals are available to guide architects and engineers through the design process, including the selection of options, sizing, and specifications.

Chapter Five provides guidance on design requirements.



References and Resources

- *Start at the Source* (BASMAA, 1999)
- California Best Management Practice Handbooks (SWQTF, 1993).
- Urban Runoff Quality Management (WEF/ASCE, 1998)
- Low Impact Development Design Strategies: An Integrated Approach (Maryland, 2001)
- Site Planning for Urban Stream Protection (Scheuler, 1995)
- *Urban Small Sites Best Management Practice Manual* Metropolitan Council of Governments (Minneapolis/St. Paul)

Environmental Benefit Perspective

The unusually diverse natural geography of the Santa Clara Basin – the area that drains to southerly South San Francisco Bay – includes tidal wetlands, alluvial plains, and mountain slopes. Annual rainfall varies from around 60 inches in the Santa Cruz Mountains to 15 inches or less in Milpitas and other parts of the Santa Clara Valley.

Milpitas' climate and location on a broad alluvial plain give its streams a characteristic structure of riffles, pools, terraces, floodplains, and wetlands. In relatively undisturbed stream reaches, this geomorphic structure supports trees and other riparian vegetation. Trees provide shade (cooling stream temperatures), create root wads and undercut banks (refuge for fish) and produce falling leaves and detritus (the bottom of a food web). Fish, frogs, and other animals have evolved to thrive in riparian habitats. Because the habitats are diverse and complex, there are many species that are specialized, have limited ranges, and may be rare.

The landscape of Milpitas, like that of all the San Francisco Bay Area, has been repeatedly transformed since the Spanish arrived in the 1770s. Even before the area was developed, European grasses, weeds, and other plants replaced much of the native vegetation. Creek flows were diverted to irrigate farms; later, pumping lowered the groundwater table. Wetlands were diked to create salt evaporators or were filled for farmland.

Urban development came to Milpitas after the Second World War. To make flood-prone land suitable for development, creeks were channelized or confined within levees. Buildings, streets, and pavement now cover much of the land, and storm drains pipe runoff from urban neighborhoods directly into the creeks. Urbanization has changed the timing and intensity of stream flows and has set off a chain of unanticipated consequences. These consequences include more frequent flooding, destabilized stream banks, bank armoring, loss of streamside trees and vegetation, and the destruction of stream habitat.

The remaining habitat, even where it has been disturbed and reduced to remnants, is an important refuge for various species. The U.S. and California have listed some of these species as endangered, threatened, rare, or having other special status. The riparian habitat along Coyote Creek, including the portion within the City of Milpitas, provides some of the best remaining riparian habitat in Santa Clara County. The area may support burrowing owls and provides potential breeding habitat for various songbirds (including listed yellow warblers) and hunting grounds for raptors, including hawks and owls. Belted kingfishers have been seen flying over Coyote Creek and Berryessa Creek (Milpitas 2001).

In the foothills, riparian areas along creeks support a variety of songbirds and raptors. Insects that thrive in the vegetation provide a food source for bats and lizards, and tall trees may be nesting sites for orioles and hawks. Most of the creeks that wind across Milpitas' alluvial plain remain unburied (although many are channelized). Existing and potential habitat within and along these creeks is not well documented.

Natural streams and their ecosystems cannot be fully restored. However, **it is possible to stop, and partially reverse, the trend of declining habitat** and preserve some ecosystem values for the benefit of future generations.

This is an enormous, long-term effort. The runoff from a single development site may seem inconsequential, but by changing the way sites are developed (and redeveloped), we may be able to preserve and enhance existing stream ecosystems in urban areas.

References and Resources

- *Restoring Streams in Cities* (Riley, 1998)
- *Stream Restoration: Principles, Processes, and Practices* (Federal Interagency Stream Restoration Working Group, 1998)
- Santa Clara Basin Watershed Management Initiative *Watershed Characteristics Report* (SCBWMI, 2001) and *Watershed Action Plan* (SCBWMI, 2003).
- *Coyote Creek Trail Public Draft Initial Study* (City of Milpitas, 2001).

Chapter 2

Stormwater Concepts

All about BMPs, MEP, imperviousness, etc.

Like practitioners in any other specialized field, planners and engineers working on stormwater control have created their own lingo. Within the array of acronyms and shorthand, there are several key concepts – some of them based on water-quality regulations, others on evolved design practice – that are indispensable to communication between project proponents, designers, and reviewers.

The glossary at the front of this Guidebook lists words and concepts that can be explained adequately in a sentence or two. Other concepts require elaboration, including explanation of how they apply to designing and permitting development projects in the City of Milpitas.

This chapter explains the following key concepts:

- Maximum Extent Practicable
- Best Management Practices
- Imperviousness
- Design Storm

Maximum Extent Practicable

As required by the Clean Water Act, the RWQCB limits the allowable concentration (and sometimes the allowable load) of pollutants in municipal and industrial wastewaters discharged to State waters.

When it amended the Clean Water Act in 1987, Congress recognized that it was not technically feasible to establish similar limits on pollutants discharged from municipal storm drains. Instead, Clean Water Act Section 402(p)(3)(iii) says that the states

> shall require controls to reduce the discharge of pollutants to the **maximum extent practicable**, including management practices, control techniques and system, design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants.

"Maximum extent practicable" is not defined in Federal law or regulation.

SCVURPPP's 1997 Urban Runoff Management Plan (approved by the RWQCB) says that "maximum extent practicable" is subjective (i.e., it requires the exercise of individual judgment), evolving, and flexible. SCVURPPP's plan emphasized that the.Co-permittees would implement **continuous improvement** to insure that their programs would consistently achieve "maximum extent practicable."

Under the stormwater discharge permit, SCVURPPP regularly updates (and the RWQCB reviews and approves) model **performance standards** that establish, for various elements of the stormwater pollution prevention program, the level of effort that currently corresponds to "maximum extent practicable."

When reviewing proposed development projects, Milpitas staff uses current performance standards and best professional judgment to determine whether proposed stormwater controls meet the "maximum extent practicable."

As knowledge of stormwater control develops, it is becoming more common for "maximum extent practicable" to be expressed as numeric criteria. For example, the 2001 amendments to the stormwater permit established numeric standards for sizing stormwater treatment BMPs. City staff must apply these standards when reviewing proposed development projects.

For other aspects of site design and treatment BMP design, City staff may consult available design manuals and apply their engineering or other professional judgment.

Best Management Practices

Clean Water Act Section 402(p) and implementing USEPA regulations (40 CFR 122.26) specify a municipal program of "management practices" to control stormwater pollutants. **Best Management Practices (BMP)** refers to any kind of procedure or device designed to minimize the quantity of pollutants that enter the storm drain system.

Since the adoption of the regulations in 1990, a rough taxonomy of BMPs has emerged:

Structural BMPs are built devices or site features (e.g., a constructed wetland), as opposed to **Operational BMPs,** which are practices or procedures (e.g., dumping washwater in an indoor sink rather than the gutter, or sweeping outside work areas daily).

Permanent BMPs are structural BMPs intended to last the life of the project (e.g. a constructed wetland), as opposed to **temporary BMPs** (e.g. silt fences) which are to be removed when construction is finished.

Source control BMPs aim to stop pollutants from entering stormwater. All operational BMPs are for source control, but source control BMPs can also be permanent structural BMPs (e.g., a berm around a dumpster area). **Treatment BMPs,** on the other hand, are features or devices that remove pollutants that have already become suspended or dissolved in stormwater.

TABLE 2-1. BMPs classified three ways.

A. Manifestation	*B. Longevity*	*C. Mode*
Structural	Permanent	Source Control
Operational	Temporary	Treatment

Provision C.3. is concerned with permanent, structural BMPs, including structural source control BMPs, permanent features of landscape and site design, and treatment BMPs.

As described in Chapter Three and Chapter Five, there are two approaches to incorporating treatment BMPs into new development sites. Treatment BMPs can be integrated into the landscape design and distributed throughout the site **(integrated/distributed treatment BMPs)**, or site drainage can be piped to a larger, engineered structural treatment BMP.

Commercial and industrial facilities must implement operational BMPs to the maximum extent practicable, and residents are expected to avoid allowing anything other than stormwater (e.g., soapy water, paint, litter) from entering storm drains. These requirements are implemented and enforced by other parts of the City of Milpitas' comprehensive stormwater pollution prevention program.

Imperviousness

Schueler (1995) proposed **imperviousness** as a "unifying theme" for the efforts of planners, engineers, landscape architects, scientists, and local officials concerned with urban watershed protection. Schueler argued (1) that imperviousness is a useful indicator linking urban land development to the degradation of aquatic ecosystems, and (2) imperviousness can be quantified, managed, and controlled during land development.

Imperviousness has long been understood as the key variable in **urban hydrology.** Peak runoff flow and total runoff volume from small urban catchments is usually calculated as a function of the ratio of impervious area to total area **(rational method).** The ratio is represented as a runoff factor, usually designated "C". Increased flows resulting from urban development tend to increase the frequency of small-scale flooding downstream.

Imperviousness links urban land development to degradation of aquatic ecosystems in two principal ways.

First, the combination of paved surfaces and piped runoff efficiently collects urban **pollutants** and transports them, in suspended or dissolved form, to surface waters. These pollutants may originate as airborne dust, be washed from the atmosphere during rains, or may be generated by automobiles and outdoor work activities.

Second, increased peak flows and runoff durations typically cause **erosion of stream banks and beds**, transport of fine sediments, and disruption of aquatic habitat. Measures taken to control stream erosion, such as hardening banks with riprap or concrete, may permanently eliminate habitat. By reducing groundwater infiltration, imperviousness may also reduce dry-weather stream flows.

Imperviousness has two major components: rooftops and transportation (including streets, highways, and parking areas). The transportation component is usually larger and is more likely to be **directly connected** to the storm drain system.

The effects of imperviousness can be mitigated by disconnecting impervious areas from the drainage system and by making drainage less efficient – i.e., by encouraging detention and retention of runoff near the point where it is generated. Detention and retention reduce peak flows and volumes and allow pollutants to settle out or adhere to soils before they can be transported downstream.

Design Storm

No two rainstorms are exactly alike. Hydrologists sort and analyze rain gauge records to find long-term patterns of rainfall **intensity** and **duration**. Then they predict runoff flows and volumes based on these patterns and on the size, slopes, soils, land uses, and drainage patterns of a particular catchment.

Engineers select a **design storm** to calculate the required size of facilities that convey, store, or treat runoff. Because small storms occur many times a year, and larger storms come once in many years, the design storm is selected based on probability (e.g., the allowable likelihood that a channel will overflow in any given year). *Often, applicable regulations specify the rainfall intensity and duration that must be used in design.*

Different design storms apply to different purposes. Selection of a design storm balances costs and benefits. Roof leaders and flood control channels are typically designed to convey runoff from a storm with a one-in-one-hundred (1%) probability of occurring in any particular year (commonly called the "one-hundred-year storm"). Flood control detention basins may be designed to hold a storm predicted to occur, on average, in 4% or 10% of the coming years (a 25-year or 10-year storm, respectively).

NPDES permit Provision C.3.d includes criteria for designing treatment BMPs. These criteria target treatment of 80% of **cumulative** runoff. (See the discussion of maximum extent practicable on page 14.) Because most runoff is produced by small storms that occur many times a year, treatment BMPs can be designed to bypass larger storms. The 80% criterion means that BMPs will be bypassed, on average, every 1-2 years.

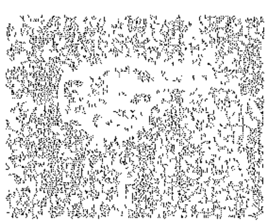
Because treatment BMPs are designed to treat only small storms, they can be considerably smaller than detention basins that are designed to protect property during flood-generating storms that may recur in 10%, 4%, or 1% of coming years. However, treatment BMPs must be designed as part of an overall drainage system that can accommodate larger storms.

Development sites subject to NPDES permit Provision C.3.f will be required to maintain runoff peak flows and durations that existed prior to development. SCVURPPP's **Hydromodification Management Plan** (HMP) will specify locations where C.3.f applies and will also identify the design storm or storms that must be used to compute peak flows and durations.

Chapter 3

Preparing Your Stormwater Control Plan

Step-by-step assistance for site design and BMP selection.



Prepare your Stormwater Control Plan for submittal along with the other items staff has marked on the Planning Division's "Check Sheet for Planning and Zoning Application." Discuss specific requirements that may apply to your project at the pre-application meeting with City staff.

▸ OBJECTIVES.

Your Stormwater Control Plan should demonstrate that your project will incorporate site design characteristics, landscape features, and treatment BMPs that will minimize imperviousness, retain or detain stormwater, slow runoff rates, and reduce pollutants in post-development runoff to the **maximum extent practicable.** Additional requirements may apply if runoff from your site discharges directly to creeks or wetlands.*

A complete and thorough Stormwater Control Plan will enable Planning staff to verify that your project complies with these requirements. The City requires a Stormwater Control Plan for every applicable project so that City staff can document the City's compliance with its RWQCB permit.

▸ CONTENTS.

Your Stormwater Control Plan will consist of a plan and a report. Staff will use the following checklist to evaluate the completeness of your Plan.

* See RWQCB Order 01-119, Provision C.3.(b)(ii).

STORMWATER CONTROL PLAN CHECKLIST

▶ CONTENTS OF PLAN

As appropriate, show on plans:

- ☑ Existing natural hydrologic features (depressions, watercourses, relatively undisturbed areas) and significant natural resources.
- ☑ Soil types. Soil characteristics must be confirmed by site inspection or boring records if a subsurface infiltration rate is used in design calculations.
- ☑ Depth to groundwater. Must be confirmed if groundwater is generally shallow (<15 feet below ground surface) and a subsurface infiltration rate is used in design calculations.
- ☑ Pollutant source areas, including loading docks, food service areas, refuse areas, outdoor processes and storage, vehicle cleaning, repair or maintenance, fuel dispensing, equipment washing, etc.
- ☑ Existing and proposed site drainage network and connections to watercourses or storm drains.
- ☑ Separate drainage areas, depending on complexity of drainage network.
- ☑ For each drainage area, types of impervious area (roof, plaza/sidewalk, and streets/parking) and area of each.
- ☑ Proposed design features and surface treatments used reduce to imperviousness or impervious area.
- ☑ Proposed locations of infiltration or treatment BMPs.

▶ CONTENTS OF REPORT

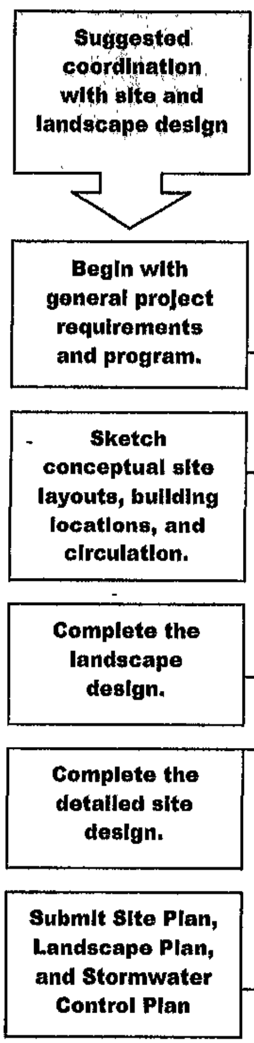
A report accompanying the plan should include:

- ☑ A narrative analysis or description of site features and conditions that constrain, or provide opportunities for, stormwater control.
- ☑ A narrative description of site design characteristics that protect natural resources.
- ☑ A narrative description and/or tabulation of site design characteristics, building features, and pavement selections that reduce imperviousness of the site.
- ☑ A table of identified pollutant source areas and for each, the source control measure(s) used to reduce pollutants to the maximum extent practicable.
- ☑ Tabulation of pervious and impervious area, showing self-retaining areas, areas tributary to each infiltration or treatment BMP.
- ☑ Preliminary designs, including calculations, for each infiltration or treatment BMP. BMPs must meet numerical standards set by the Regional Water Quality Control Board. Designs should include elevations showing sufficient hydraulic head for each feature or device.
- ☑ General description of BMP maintenance requirements.
- ☑ A licensed professional engineer's certification that the measures specified in the report meet the requirements of the RWQCB Order.

Step by Step

The City recommends that you plan and design your stormwater controls integrally with the site planning and landscaping for your project. It's best to start with general project requirements and preliminary site design concepts and then prepare the detailed site design, landscape design, and stormwater control plan simultaneously.

Even if a site design has already been prepared, you can still incorporate adequate stormwater controls. However, because you'll be working within the constraints of the design, you may be limited to selecting more expensive, higher-maintenance, and less aesthetically pleasing stormwater treatment options.



The following step-by-step procedure should optimize your design by identifying the best opportunities for stormwater controls **early in the design process.** Regardless of which design procedure you use, you should still review this chapter for explanation of expectations and requirements for your Stormwater Control Plan.

The recommended steps are:

1. Assemble needed information.
2. Identify site opportunities and constraints.
3. Design to minimize imperviousness.
4. Locate and select treatment BMPs.
5. Perform preliminary design of treatment BMPs.
6. Specify source controls.
7. Integrate the Stormwater Control Plan with site and landscape plans.
8. Identify permitting and code compliance issues.
9. Identify BMP maintenance requirements.
10. Complete the Stormwater Control Plan.

Step 1: Assemble Needed Information

To select types and locations of BMPs, the designer needs to know basic characteristics of the site's surface and subsurface drainage:

- **Existing natural hydrologic features** and natural resources, including any contiguous natural areas, wetlands, watercourses, seeps, or springs.

- **Existing site topography**, including contours of any slopes of 10% or steeper, general direction of surface drainage, local high or low points or depressions, any outcrops or other significant geologic features.

- **Zoning**, including requirements for **setbacks** and **open space**.

- **Soil types.** In general, selection and design of infiltration BMPs is based on the soil types A, B, C, and D cataloged in Appendix A of USDA Technical Release 55, *Urban Hydrology for Small Watersheds.* Preliminary identification of soil types may be made from the soils map in Appendix A of this Guidebook. Where questions may exist regarding soil types or infiltration rates, obtain site-specific information (where available) from site inspection, boring logs, or geotechnical studies associated with previous design or construction.

- **Depth to groundwater.** The City has mapped areas where groundwater is shallow enough to infiltrate the sewer system. See Appendix B. This includes most (but not all) of the City west of Highway 680. Additional sources for groundwater elevations include:

  - Records of the Santa Clara Valley Water District

  - Records from the City's domestic wells.

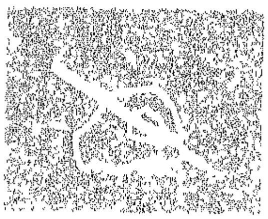
  - Results from geotechnical studies associated with previous design and construction for the site.

- **Existing site drainage.** For undeveloped sites, this should be obtained by inspecting the site and examining topographic maps and survey data. For previously developed sites, site drainage and connection to the City storm drain system should be located from site inspection, City storm drain maps (available from the Land Development Section, Engineering Division), and plans for previous development. It may be possible to locate drainage plans submitted with previous building permit applications.

References and Resources

- USDA SCS Technical Release TR55, Appendix A: Soil Types
- City of Milpitas Municipal Code, Title XI, Chapter 10 (Zoning)
- City of Milpitas Soil Maps
- City of Milpitas Groundwater Infiltration Evaluation

Step 2: Identify Constraints & Opportunities



Review the information collected in Step 1. Identify the principal constraints on site design and BMP selection as well as opportunities to reduce imperviousness and incorporate BMPs into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, landscape amenities including open space and buffers (which can double as locations for BMPs), and differences in elevation (which can provide hydraulic head for BMPs).

Prepare a brief **narrative** describing site opportunities and constraints. In the review process, this narrative may help establish the **maximum extent practicable** degree of stormwater control for your site.

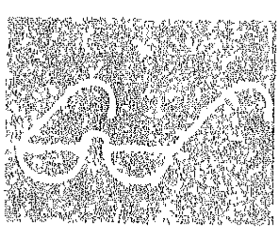
Step 3: Design to Minimize Imperviousness

▶ ***CLUSTER DEVELOPMENT***

Chapter Four of *Start at the Source* (BASMAA, 1999) lists the following design principles which can be applied to the layout of newly developed and redeveloped sites:

ICON KEY
Helpful Tip
Submittal Requirement
Terms to Look Up
References & Resources

- Define development envelope and protected areas, identifying areas that are most suitable for development and areas that should be protected.
- Set back development from creeks, wetlands, and riparian habitats.
- Preserve significant trees. (Note: City Ordinance MMCX-2 defines "protected" trees and "heritage and specimen plantings.")
- Avoid erosive soils and steep slopes.



For **new subdivisions**, the Milpitas General Plan encourages the use of **Planned Unit Developments** (PUDs) both on hillsides and the valley floor. Development within PUDs should be clustered to minimize imperviousness and other environmental impacts. A simple four-step procedure to lay out clustered subdivisions has been used throughout the U.S. (Natural Lands Trust, 2001):

1. Identify land that should be permanently protected.

2. Locate the sites of individual houses within the development area so that their views of the open space are maximized.

3. "Connect the dots" with streets and informal trails.

4. Draw the lot lines.

► OPTIMIZE THE SITE LAYOUT

For all types of development, **limit overall coverage** of paving and roofs by designing compact, taller structures, narrower lanes for circulation, smaller parking lots, and indoor or underground parking. Examine site layout and circulation patterns and identify areas where landscaping or planter boxes can be substituted for pavement.

► MINIMIZE IMPERVIOUSNESS

With the built and landscaped areas defined on a site drawing, look for opportunities to minimize directly connected impervious area:

- **Direct runoff from impervious areas to adjacent pervious areas** or depressed landscaped areas. A 1:1 ratio of impervious to pervious area is generally acceptable; a 2:1 or higher (impervious/pervious) ratio may be appropriate where soils permit. Much higher ratios (over 20:1) can be used with an appropriately designed landscape infiltration/bioretention BMP, which may require a subsurface liner and drainage.

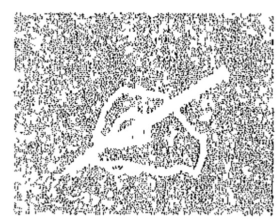
- **Select permeable pavements and surface treatments.** Inventory the site's paved areas and identify locations where permeable pavements, such as crushed aggregate, turf block, or unit pavers can be substituted for impervious concrete or asphalt paving.

► DETAIN AND RETAIN RUNOFF THROUGHOUT THE SITE

- **Use drainage as a design element.** Use above-ground drainage swales, depressed landscape areas, vegetated buffers, and bioretention areas as amenities and focal points within the site and landscape design.

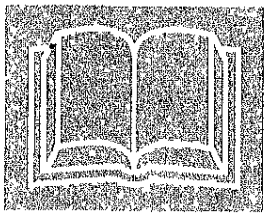
► DOCUMENT YOUR DESIGN

Chapter Five describes how to document pervious and impervious areas within your project and how to quantify the benefits achieved by your design decisions to reduce paved and roofed area, to create self-retaining landscaped areas and pervious pavements, and to direct runoff from impervious to pervious areas.



Chapter Five also includes instructions for using the provided spreadsheet to create a table of pervious areas within your site.

To accompany the table, prepare a brief **narrative** that documents the site layout and site design decisions you made that minimize imperviousness, retain or detain stormwater, slow runoff rates, and reduce pollutants in post-development runoff to the maximum extent practicable.



References and Resources

- *Start at the Source* (BASMAA, 1999).
- *Growing Greener* (National Lands Trust, 2001).
- *City of Milpitas General Plan* (Milpitas, 1994).
- *City of Milpitas Municipal Code*, Title XI, Chapter 10 (Zoning)
- *Low Impact Development Manual* (Prince Georges County, 1999).
- *Site Planning for Urban Stream Protection* (Schueler, 1995b).

Step 4: Locate and Select Treatment BMPs

In Step 3, you minimized the total quantity of runoff by reducing impervious area and directing some runoff to pervious areas. You also sketched the site's drainage system, divided the site into drainage areas, and tabulated pervious areas.

In this step, inventory and tabulate impervious areas and identify appropriate locations for **treatment BMPs** that will capture, then retain, detain, or treat the remaining runoff before it flows offsite. Then select the appropriate treatment BMPs. The opportunities and constraints identified earlier (in Step 2) will help guide this process.

There is no hard-and-fast procedure or set of rules for selecting treatment BMPs. Selection is ultimately by the designer's professional judgment and preference, but the suite of BMPs selected must meet the criteria set in the RWQCB permit.

A first consideration in identifying a drainage and treatment strategy is to decide whether **infiltration** is a practical option for the site. In general, the cheapest and most effective treatment BMPs are adequately sized infiltration areas that are designed into site landscaping. In sites with space constraints, infiltration can be promoted by using surface infiltration basins or subsurface trenches or dry wells.[1]

In many sites, however, infiltration BMPs cannot be used because of steep slopes, geotechnical instability, high groundwater, low-permeability soils, or a combination of these factors. BMPs for these sites will use **detention or treatment**, rather than infiltration, to manage runoff.

For sites that use detention and treatment, the primary limiting design factors will be available **space** and available hydraulic **head** (difference in water surface elevation between inflow and outflow). In some cases, a small adjustment of

[1] The Santa Clara Valley Water District (SCVWD) restricts the use of dry wells and other subsurface infiltration BMPs. Applicants should obtain an opinion from SCVWD staff before incorporating these BMPs into their Stormwater Control Plan.

elevations within the site plan can make a treatment option feasible and cost-effective.

A second consideration in developing a drainage and treatment strategy is whether to route most or all drainage through a single detention and treatment BMP or to disperse smaller BMPs throughout the site. Piping runoff to a single treatment area may be simpler and easier to design, but designs that integrate swales, small landscaped areas, and planter boxes throughout the site can be more cost-effective and aesthetically pleasing.

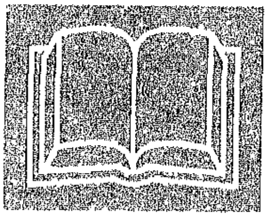
Urban Runoff Quality Management (Water Environment Federation Manual of Practice No. 23; American Society of Civil Engineers Manual and Report on Engineering Practice No. 87) focuses on larger, engineered systems. For areas with less permeable soils (NRCS Soil Types C & D), and where nutrients are not a major concern, this manual recommends extended detention, ponds with permanent pools, constructed wetlands, or media filtration.

Low Impact Development Strategies: An Integrated Design Approach (Prince George's County, Maryland, Department of Environmental Resources, 1999) guides the designer through the **Low Impact Development** (LID) approach to stormwater control, which emphasizes small, cost-effective widely distributed landscape features rather than larger facilities located at the bottom of drainage areas.

Either approach may be best for a particular site, or elements of both approaches may be combined. In addition to the WEF/ASCE Manual and Low Impact Development manual, the City of Portland's *Stormwater Manual* (revised 2002) includes many design details for treatment BMPs.

The City of Milpitas maintains a library of manuals and other design guides for your reference. Staff will provide information on how to obtain paper or electronic copies. These manuals should be used as a starting point for selection and design of treatment BMPs that meet the RWQCB requirements and City of Milpitas codes. Keep in mind that the criteria and recommendations in these manuals may be different, or inapplicable, to projects in the City of Milpitas.

Although the City of Milpitas has no general recommendation for selecting BMPs, the City does require that the overall design for the site meet RWQCB requirements, the City's planning and zoning requirements, and applicable building codes. The designs must also be maintainable. Maintenance requirements for BMPs must be identified in the Stormwater Control Plan. A **Stormwater BMP Maintenance Plan** will be required as a Condition of Approval for the project.

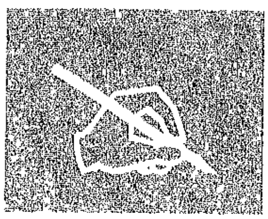


References and Resources

- RWQCB Order 01-119, Provision C.3.d
- *Urban Runoff Quality Management* (WEF/ASCE, 1998).
- *Low Impact Development Manual* (Prince Georges County, 1999).
- *Start at the Source* (BASMAA, 1999).
- *Stormwater Manual* (City of Portland, 2002).
- *California Stormwater BMP Municipal Handbook*
- *Minnesota Urban Small Sites BMP Manual* (Barr Engineering, 2001)

Step 5: Perform Preliminary Design of BMPs

Demonstrate the feasibility and effectiveness of the treatment BMPs you selected by showing that they meet the design criteria in Chapter Five. Detailed construction drawings are not required at this stage, but drawings or sketches should be included as needed to illustrate the proposed design and to support calculations.

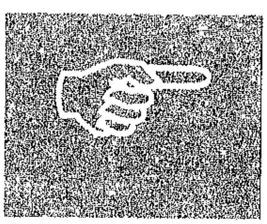


Chapter Five includes a set of widely applicable BMPs that can be integrated into the landscape and distributed throughout the site (**Integrated/distributed BMPs**). Chapter Five also provides a method of accounting for pervious and impervious areas and for demonstrating that the suite of BMPs you choose is sufficient to meet the RWQCB permit requirements. See page 42. The City recommends that you use this procedure in preparing your Stormwater Control Plan.

Step 6. Specify Source Control BMPs

Some everyday activities – such as trash recycling/disposal and washing vehicles and equipment – generate pollutants that tend to find their way into storm drains. These pollutants can be minimized by applying **source control BMPs.**

Source control BMPs include **permanent**, structural features that must be incorporated into your project plans and **operational** BMPs, such as regular sweeping and "housekeeping," that must be implemented by the site's occupant or user. The maximum extent practicable standard typically requires both types of BMPs; in general, operational BMPs cannot be substituted for a feasible and effective permanent BMP.



Use the following procedure to specify source control BMPs for your site:

▸ **IDENTIFY POLLUTANT SOURCES**

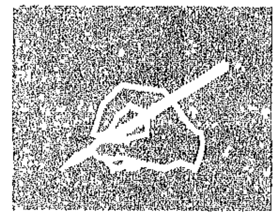
Review your preliminary site plan. Then review the first column in the table of source control measures (Appendix C). Check off the sources of potential pollutants that apply to your site and note the corresponding locations on the site plan.

► **IDENTIFY PERMANENT SOURCE CONTROL MEASURES**

Use the Source Control Measures table (Appendix C) to prepare a table listing each potential source on your site and the corresponding permanent, structural BMPs used to prevent pollutants from entering runoff. This will provide a guide to Source Control Measures that will be included in your building permit application.

TABLE 3-1. Format for table of permanent source control measures.

Potential source of runoff pollutants	*Permanent source control BMPs*

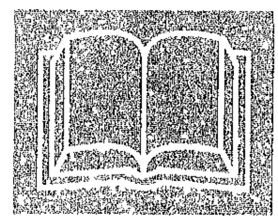


► **IDENTIFY OPERATIONAL SOURCE CONTROL BMPS**

Again referring to the Source Control Measures table (Appendix C), prepare a list of operational BMPs that should be implemented continually as long as the anticipated activities uses continue at the site. The City's Urban Runoff ordinance requires that these BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable discretionary approval for use of the site.

References and Resources

- RWQCB Order 01-119, Provision C.3.k
- SCVURPPP Planning Procedures – Model List of Source Control Measures
- SCVURPPP Model Conditions of Approval for Pesticide Reduction in Landscaping Plans
- SCVURPPP Landscape Maintenance Techniques for Pest Reduction
- *Start at the Source*, Section 6.7: Details, Outdoor Work Areas
- *California Stormwater Industrial/Commercial Best Management Practice Handbook*
- *Urban Runoff Quality Management* (WEF/ASCE, 1998) Chapter 4: Source Controls



Step 7: Integrate With Other Preliminary Drawings.

Depending on the complexity of the project, the Stormwater Control Plan drawing may be combined with the site plan, landscape plan, or drainage plan. In any case, the plans should be carefully coordinated with these plans and with site grading and drainage.

Here are some typical considerations that may arise in coordinating stormwater control plans with other construction plans:

Building Drainage. Building codes require that drainage from roofs and impervious areas be drained away from the building. The codes also specify minimum sizes and slopes for roof leaders and drain piping. Detailed designs of

BMPs located in or on the building, or within 10 feet of building foundations, must accommodate these codes while also meeting the minimum requirements for detention or flow stated in Provision C.3.

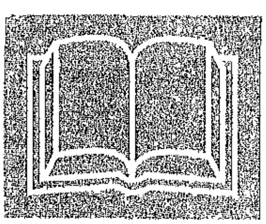
Control of elevations. Distribution of overland flow to landscaped areas may require that grading and landscape plans be executed with greater attention to slopes and elevations.

Drainage Plans. The City may require a drainage plan when the project final design is submitted for plan check. The drainage plan is designed to prevent street flooding during a 10-year storm and successfully route flows from a 100-year storm. To meet the requirements for both the Stormwater Control Plan design storm and the Drainage Plan design storm, BMP designs must incorporate bypasses or overflows to route excess flows to the storm drain system. It may be necessary to complete a preliminary drainage plan at the planning and zoning review stage.

Plant selection. Depressed landscaped areas, bioretention areas, vegetated swales, and many other BMPs require appropriate plant selection to work properly. This plant selection should be coordinated with or incorporated into the landscape plan. The City of Milpitas requires landscaping to be designed for water conservation (City Code, Title VIII, Chapter 5, Water Efficient Landscapes) and also requires that potable water not be used for irrigation where recycled water is available (Title VII, Chapter 6, Water Conservation).

Access for periodic maintenance. All BMPs will require access for periodic inspection in accordance with an approved maintenance plan. Many BMPs (e.g., bioretention basins and swales) require relatively little maintenance, but others (e.g., sand filters or proprietary devices) may require regular replacement of surface sand or replacement of cartridges or inserts. Site plans should provide for the necessary access for personnel and equipment.

Organizing traffic and parking. Your stormwater control plan may call for depressing landscaped areas below paved areas, rather than setting them above paved areas and surrounding them with curbs. Striping or bollards may be needed to guide traffic. Parking lots with crushed aggregate, unit-paver, and other permeable pavements may require bollards, signs, or other indicators to organize parking.



References and Resources

- Milpitas Municipal Code
- City of Milpitas Standard Details

Step 8: Permitting & Code Compliance Issues.

To meet the RWQCB's "maximum extent practicable" standard, Stormwater Control Plans will typically need to incorporate innovative site design features, pavements, drainage design practices, and BMPs. Because these practices are new, they may be inconsistencies with existing building codes, engineering requirements, and standard conditions of approval.

The City makes no representation that the design practices or recommendations in this guidebook (or in the publications listed as references and in the bibliography) meet existing applicable codes or standards.

Where conflicts occur between recommended stormwater control practices and existing codes and standards, City staff will work with the applicant to identify one or more regulatory or design solutions that can satisfy all applicable requirements.

The City encourages you to identify these potential conflicts in the Planning and Zoning Review phase and to document the potential conflicts in the Stormwater Control Plan. By doing so, it may be possible to resolve the issue prior to final design. This will help avoid the need for redesign and resubmittal of final plans and associated project delays.

Step 9: Identify BMP Maintenance Needs

As required by NPDES Permit Provision C.3.e, the City will periodically verify that treatment BMPs are maintained and continue to operate as designed.

Ongoing maintenance of BMPs will be the responsibility of the property owner.

Before a Certificate of Occupancy is issued, the City will require submittal of a **Stormwater Control Operation and Maintenance Plan** for the site. The plan will list all treatment BMPs on the site along with the required periodic maintenance. The City may require an annual report to verify that this maintenance has been done, and will also refer to the operation and maintenance plan during site inspections.

During the detailed design and construction phases of your project, you should note any additional issues or concerns that may be specific to your site or to a specific BMP installation. For example, it may be necessary to verify that weirs and flow spreaders remain level and that sediment and debris accumulated during constructin does not fill depressions or clog inlets and outlets. These items to be verified post-construction should be included in the Stormwater Control Operation and Maintenance Plan.

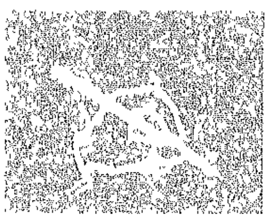
Your Stormwater Control Operation and Maintenance Plan must include the project developer's signed statement accepting responsibility for maintenance until the responsibility is legally transferred.

▶ MAINTENANCE NEEDS AND YOUR STORMWATER CONTROL PLAN

Your Stormwater Control Plan should include a general description of anticipated BMP maintenance requriemetns. This will help insure that:

- Ongoing costs of maintenance have been considered in your BMP selection and design.
- Site and landscaping plans provide for access by maintenance equipment.
- Landscaping plans incorporate irrigation requirements for BMP plantings.
- Initial maintenance and replacement of BMP plantings is incorporated into landscaping contracts and guarantees.

Chapter Six includes a discussion of **typical maintenance requirem**ents for some commonly used BMPs.



Step 10: Stormwater Control Plan & Report

Your Stormwater Control Plan Report should document the information gathered and decisions made in Steps 1-9. A clear, complete, well-organized report will make it possible to confirm that the "maximum extent practicable" standard has been applied in each aspect of the project design.

▶ SAMPLE OUTLINE AND CONTENTS

I. Project Setting

  A. Project Name, Location, Description

  B. Site features and conditions

  C. Opportunities and constraints for stormwater control

II. Measures to Limit Imperviousness

  A. Measures to cluster development and protect natural resources

  B. Measures used to limit directly connected impervious area

(1) Site design features

(2) Pervious pavements

(3) Detention and drainage design

C. Table summarizing pervious and self-retaining areas .

III. Selection and Preliminary Design of Treatment BMPs

A. Locations and Elevations

B. Sizing Calculations

C. Table summarizing impervious areas and treatment BMPs

IV. Source Control Measures

A. Description of site activities and potential sources of pollutants

B. Table showing sources and permanent controls

C. List of operational source control BMPs

V. Summary of Permitting and Code Compliance Issues

VI. BMP Maintenance Requirements

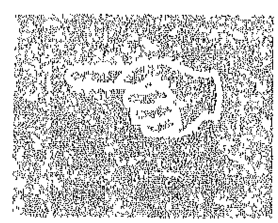
VII. Certification

▶ EXAMPLE STORMWATER CONTROL PLAN

Example Stormwater Control Plans are in Appendix D. Your Stormwater Control Plan will reflect the unique character of your own project and should meet the requirements identified in this *Guidebook*. City staff can assist you to determine how specific requirements apply to your project.

▶ CERTIFICATION

Your Stormwater Control Plan must include the certification of a licensed professional engineer stating as follows: "The selection, sizing, and preliminary design of treatment BMPs and other control measures in this plan meet the requirements of Regional Water Quality Control Board Order 01-119."



Chapter

Stormwater Control & CEQA

Incorporating stormwater impacts and control measures into Initial Studies and Environmental Impact Reports

CEQA – the California Environmental Quality Act – requires local jurisdictions to identify and evaluate the environmental impacts of their actions. Municipal actions subject to CEQA include discretionary approvals such as zoning decisions and use permits. The objectives of CEQA include disclosing to decision makers and the public significant environmental effects of proposed activities, identifying ways to avoid or reduce adverse environmental impacts, and preventing environmental damage by requiring implementation of feasible alternatives or mitigation measures.

The City requires that you complete an **Environmental Information Form** as part of your application for planning and zoning review. Depending on the project scope, additional documentation may be required. Your Stormwater Control Plan contains information to be reviewed under CEQA.

The Planning Division will complete an **Environmental Checklist** and **Initial Study** for your project. Depending on the results of the Initial Study, the Planning Division may recommend a Negative Declaration or Mitigated Negative Declaration be issued for the project, or it may recommend that an Environmental Impact Report be prepared.

Further guidance on the CEQA process is available from the Planning Division and from the references and resources 🕮 listed on page 36.

The purpose of this chapter is to clarify how information in your Stormwater Control Plan will be used in the CEQA review process.

CEQA and Water Quality Regulations

NPDES permit provision C.3.m states that when the City conducts environmental review of projects, it must evaluate water quality effects and identify appropriate mitigation measures.

The Governor's Office of Planning and Research (OPR) recommends that CEQA lead agencies should integrate CEQA review with Federal, state, or local laws, regulations, or policies "to the fullest extent possible." (CEQA Guidelines §15124). In 1998, OPR revised the example Environmental Checklist Form (CEQA Guidelines Appendix G) to more closely align with Federal and state laws and requirements, including those of the state's Fish and Game Code, the Federal Clean Water Act, and the California Water Code. The City of Milpitas uses the OPR Environmental Checklist Form.

Specific questions on the Environmental Checklist Form connect the potential significance of project impacts with existing water-quality regulations. For example, Question VIII.a asks: **"Would the project violate any water quality standards or waste discharge requirements?"**

The potential effects of increased runoff peak flows and durations are addressed in question VIII.c: **"Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation off-site?**

Potential impacts of runoff pollutants are targeted in Question VIII.e, which asks: **"Would the project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?"**

Finally, Question VIII.f. asks: **"Would the project otherwise substantially degrade water quality?"**

With the promulgation of the NPDES C.3 provisions, the RWQCB has, in effect, set more specific standards for what constitutes "substantial additional sources" of runoff pollutants.

Thresholds of Significance

A threshold of significance can be defined as "a quantitative or qualitative standard, or set of criteria, pursuant to which the significance of an environmental effect may be determined." (OPR 1994). Thresholds are not rigid or absolute – the significance of an activity depends on its specific location – but they do help Lead Agencies make consistent and well-supported determinations.

In most cases, the City of Milpitas will regard projects that exceed the threshold in NPDES permit provision C.3.c. – defined therein as a "Group 1 project" – to have potentially significant impacts due to increases in runoff pollutants. This threshold is set at 1 acre of new impervious area for projects with applications deemed complete on July 15, 2003 or later, and at 5000 square feet of new impervious area for projects with applications deemed complete on October 15, 2004 or later (subject to RWQCB consideration and possible approval of an alternative standard). The threshold does not apply to projects for which the City has issued a waiver of the requirements for treatment BMPs as provided in NPDES permit Provision C.3.g. The threshold and requirements are intended to address both cumulative and site-specific increases in runoff pollutants due to imperviousness.

A project may also have potentially significant impacts due to increases in runoff pollutants if the facility includes outdoor storage of materials or wastes or if it accommodates outdoor activities such as automotive or equipment repair. Examples include car washes, grocery stores, some restaurants, and corporation yards. The threshold of significance in this case is qualitative and requires project-specific assessment of the potential for pollutants generated on-site to reach storm drains.

Following RWQCB approval of the **Hydromodification Management Plan** (HMP) currently being prepared by SCVURPPP, the City will consider whether to adopt a threshold of significance, based on that plan, for impacts related to increased runoff peak flows and durations that could result in substantial erosion or siltation off-site (as suggested by Environmental Checklist Form Question VIII.c).

Incorporating Mitigation Measures

The RWQCB's C.3 provisions create a *de facto* threshold of significance for stormwater pollutant impacts; they also identify corresponding measures that can mitigate those impacts below the level of significance.

In general, the implementation of treatment BMPs that meet the numeric criteria in Provision C.3.d, as described in Chapter 5, will mitigate the effects of increased imperviousness on water quality to a level that is less than significant. Similarly, implementation of recommended source control BMPs for each identified source of potential pollutants will effectively mitigate the creation of these additional sources.

Following RWQCB approval of the HMP, the City will consider how to define the required level of mitigation necessary to reduce the impacts of increased peak flows or durations to a level of insignificance.

Stormwater Impacts and the CEQA Process

In summary, if the amount of impervious area created by a project is less than the threshold identified in NPDES permit provision C.3.c, and there are no significant new sources of runoff pollutants created by the project, the relevant questions on the Initial Study Checklist can be answered "less than significant impact."

If a project is required to implement treatment BMPs pursuant to NPDES permit C.3.c, the potential for significant stormwater impacts should be noted on the **Environmental Information Form**. This can be done by checking "yes" in response to **Question 26** (Change in ocean, bay, lake, stream, or ground water quality or quantity or alteration of existing drainage patterns) and **referencing the Stormwater Control Plan** for the project.

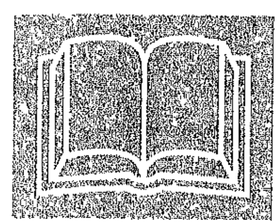
If the Stormwater Control Plan for the project meets the criteria in NPDES permit C.3.d and incorporates recommended source control measures for each potential source of pollutants identified, then the relevant questions regarding stormwater quality in the **Initial Study Checklist** can, in most cases, be answered "less than significant with mitigation incorporation." The City's initial study will note the specific source control and treatment BMPs incorporated and will reference the Stormwater Control Plan.

In some cases, a project may be below the threshold defined in Provision C.3.c but still create a significant new source of potential runoff pollutants. This might occur, for example, with an application for a use permit for a new business (say, a car wash) on an already fully developed (and impervious) site. In these cases, potential impacts can be mitigated through incorporation of appropriate permanent and operational source control BMPs.

Note that source control or treatment BMPs must be maintained for the life of the project to effectively mitigate the potential environmental effect. Similarly, operational BMPs must be implemented thoroughly and consistently to be effective mitigations. Monitoring of permanent BMPs will be accomplished through the City's **BMP verification program** (Chapter Six). The City also inspects industrial and commercial sites to verify consistent use of operational BMPs.

References and Resources

- California Environmental Quality Act Statutes (Public Resources Code §21000 et. seq.)
- Governor's Office of Planning and Research
- City of Milpitas Environmental Information Form
- City of Milpitas Environmental Impact Assessment Form (Initial Study Checklist)
- CEQA Deskbook (Bass, et. al., 2001)



Chapter 5

Technical Requirements

Technical guidance for designing self-detaining areas and sizing treatment BMPs

This chapter will help you document the technical aspects of your site design and treatment BMPs. Your Stormwater Control Plan (Chapter 3), submitted with your planning and zoning application, must show the locations, sizes, and types of treatment BMPs. During plan check, City staff will conduct a detailed technical review of your construction plans. As part of this review, staff will evaluate your design for compliance with the numeric criteria in the RWQCB's NPDES permit.

The chapter has three parts. The first part explains the applicable criteria, interprets the RWQCB's aims in establishing the criteria, and refers to the documents, studies, and rationales on which the criteria are based. This part also provides some recommendations for selecting among the alternative criteria allowed by the RWQCB.

The second part of the chapter provides guidance for designing and documenting **self-retaining areas** and treatment BMPs. The recommended process aims to maximize the use of self-retaining areas and **integrated/distributed BMPs** while providing multiple options and flexibility to the designer. The process involves step-by-step completion of a table that will facilitate plan checking. This table should be submitted as part of your Stormwater Control Plan. See Chapter 3.

The third part of Chapter Five provides some sample specifications and details for treatment BMPs, design recommendations and tips, and references to available design manuals and guidance.

ICON KEY

- Helpful Tip
- Submittal Requirement
- Terms to Look Up
- References & Resources

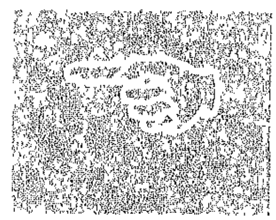
Stormwater Control Technical Criteria

The NPDES C.3. provisions require a complex, multifaceted approach to on-site stormwater control. In effect, project applicants must implement several different, independent measures to control stormwater pollutants, and each of these measures must independently meet a "maximum extent practicable" standard.

Specifically, applicants must control pollutant sources to the maximum extent practicable, limit pesticide use and potential impacts to the maximum extent practicable, and implement site design and landscape features which reduce runoff pollutants to the maximum extent practicable.

Most measures of "maximum extent practicable" are qualitative and are based on professional judgment and current practices. However, the permit includes **numeric criteria** for the design of treatment BMPs. These numeric criteria are intended to insure that the treatment BMPs are adequately designed to remove a significant portion of pollutants in runoff.

The permit also requires limits on peak runoff flow and peak runoff volume. Santa Clara Valley cities and the Santa Clara Valley Water District are working together, through SCVURPPP, to develop a required **Hydromodification Management Plan** (HMP). The HMP, which is still in preparation, will identify areas where peak runoff flow and volume must be controlled. In these areas, post-project runoff must not exceed estimated pre-project rates or durations.



The planned HMP limits on runoff peak flow and volume are independent of the current requirements for treatment to achieve pollutant removal.

The HMP is to be submitted to the RWQCB by October 15, 2003. The RWQCB will set a schedule for its implementation. In the interim, for project applications deemed complete by **July 15, 2003** or later, projects must incorporate BMPs that meet the numeric criteria intended to insure treatment effectiveness.

Typically, BMPs designed for flow control will attempt to detain enough runoff to avoid increases in the peak flows that result from a 2-year, a 5-year, and a 10-year storm.

BMPs for pollutant removal are designed to treat runoff from smaller (1 to 2-year) storm. However, they are also designed to provide longer detention (e.g., 40 hours) to provide plenty of time for pollutants to settle out.

Basins or ponds can achieve detention and retention for flow control and also meet the detention time required to insure effective pollutant removal, but the design may require multiple discharge points at different depths.

The RWQCB permit requires a 10-foot vertical separation between the bottom of any "treatment BMPs that function primarily as **infiltration** devices" and the "seasonal high groundwater mark." In addition, these BMPs should not serve work areas, including automotive shops, car washes, fleet storage, nurseries, or other areas that may be significant sources of pollutants.

In many areas of Milpitas, particularly those west of I-880, high groundwater and impermeable soils preclude the use of infiltration. In some areas east of I-680, steep slopes and geological instability make infiltration inadvisable.

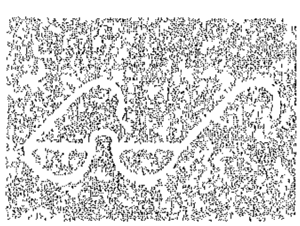
▶ NUMERIC CRITERIA

The RWQCB permit assumes that treatment BMPs can be classified as relying either on detention and infiltration (e.g. detention basins, dry wells, or constructed wetlands) or on filtration (e.g., sand filters). The permit specifies volume-based criteria for those BMPs relying on infiltration and detention and flow-based criteria for BMPs relying on filtration.

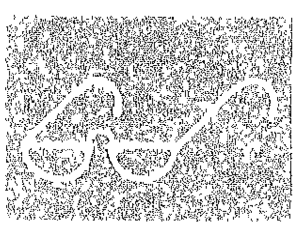
▶ VOLUME-BASED CRITERIA

The RWQCB permit specifies two alternative methods for calculating **water quality volume**, the volume of water that must be detained for a BMP to meet the "maximum extent practicable" criterion. The first method is stated in the book *Urban Runoff Quality Management* (Water Environment Federation Manual of Practice No. 23; ASCE Manual and Report on Engineering Practice No. 87, 1998) and is referred to as the **WEF Method.** The second method is in Appendix D of the *California Storm Water Best Management Practice Handbook (Municipal)* (SWQTF, 1993) and is referred to as the **California BMP Method.**

The two methods are based on the same rainfall data and hydrological methodology, and they tend to yield similar results. The methods differ in some aspects of their practical application.



Both methods use an analysis of long-term rainfall data to identify a **design storm.** Eighty percent of total annual runoff is produced by storms this size and smaller. In the Milpitas area, the design storm totals about one-half inch of rainfall.



The WEF method requires that the designer specify a **drawdown time** of 12, 24, or 48 hours. Longer drawdown times require larger BMP volumes (because of the potential for back-to-back storms). Although the permit does not specify a drawdown time, the longer time (48 hours) has been recommended by SCVURPPP consultants. Sediments from the Bay Area's fine-grained soils require a relatively long time to settle out. The California BMP method uses a fixed drawdown time of 40 hours.

The WEF method is based on 80% capture of average annual runoff. The California BMP method allows the designer to select a capture ratio; however, the RWQCB permit specifies that an 80% capture ratio be used.

The WEF method requires estimation of a mean storm precipitation volume. This can be based on local rainfall data. The analysis is conducted by taking periodic (e.g. hourly) rain gauge data, identifying distinct storms, calculating the total rainfall depth of each, and taking an average. Analysis of over 50 years of data at the San Jose Airport gauge resulted in a mean storm size of 0.512 inches. The California BMP method incorporates this analysis into a **nomograph** for the specific locality.

To summarize the comparison so far, the two methods have a similar technical basis, and the input variables are pre-selected in the RWQCB permit requirements.

The remaining difference between the two methods is in the interpretation and calculation of impervious area.

The WEF method requires calculation of a composite (weighted) runoff coefficient for the area that is tributary to the BMP being designed. Neither the permit nor the manual to which it refers specify runoff coefficients. Typical runoff coefficients are provided in various references (e.g. ASCE Manual of Practice No. 77, WEF Manual of Practice FD0-20, *Design and Construction of Urban Stormwater Management Systems*). In general, coefficients are provided as a range applicable to types of development (e.g., multi-unit attached development, 0.60 – 0.75). The choice of a specific coefficient within this range is left to the designer's professional judgment.

The California BMP method requires estimation of "the percentage of impervious area directly connected to the storm drain system. DCIA is defined as the area covered by pavement, building, and other impervious surfaces which drain directly into a storm drain without first flowing across pervious areas (e.g. lawns)." Conceptually, the tributary drainage is divided into areas that are either wholly pervious or wholly impervious. (In fact, the input parameters to the STORM model used to generate the California BMP curves assumed 0.9 for impervious surfaces and 0.15 for pervious surfaces.)

▶ FLOW-BASED CRITERIA

The RWQCB permit allows three alternatives for calculating the **peak flow rate** that a continuous-flow BMP (e.g., a sand filter without an upstream detention area) must be able to accommodate.

All three use the **rational method** to calculate peak flows:

$$Q = C\,i\,A$$

where

Q = Peak flow rate

C = Runoff coefficient (percent imperviousness)

i = Rainfall intensity

A = Tributary area

The difference between the three methods is in the calculation of the rainfall intensity, *i*.

The three alternatives are **intensity-duration-frequency (IDF)**, **percentile rainfall intensity**, and **0.2 inches/hour**.

The **intensity-duration-frequency** alternative requires that a time of concentration (T_c) be calculated for the tributary area. Calculation of a time of concentration is based on analysis of the time required for a hypothetical drop of water to flow from the furthest point of the watershed, overland and/or through pipes, to the BMP. Once T_c is determined, a corresponding i can be found from graphs of rainfall intensity vs. time from start of storm. These graphs can be found in the *Santa Clara County Drainage Manual.* The RWQCB permit specifies use of the rainfall intensity corresponding to a 50-year storm.

The ***percentile rainfall intensity*** alternative is based on ranking the intensity of rainfall from storms over a relatively long record. The RWQCB permit specifies that the intensity of the 85th percentile storm be multiplied by two. The result for the local area (San Jose) is 0.17 inches per hour.

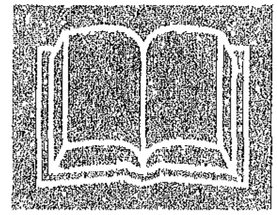
The **0.2 inches/hour** alternative simply specifies the required i : 0.2 inches per hour.

In summary, if the designer uses either the percentile rainfall intensity alternative or the 0.2 inches/hour alternative to size a flow-based BMP, he or she need only specify the tributary area and its percent imperviousness.

If the intensity-duration-frequency method is used, the designer must calculate T_c. Because calculation of T_c is complex and uncertain, and because the peak flow rate can be relatively sensitive to T_c, the City discourages applicants from using this method. It is most applicable to larger sites with overland drainage and relatively little impervious cover; however, the use of flow-based BMPs (such as sand filters) is inappropriate in such sites because of the potential for blinding the filter with fine sediments.

References and Resources

- RWQCB Order No. 01-119 (Stormwater NPDES Permit Amendments)
- *California Best Management Practice Handbooks* (SWQTF, 1993).
- *Urban Runoff Quality Management* (WEF/ASCE, 1998)
- *Hydrology Handbook, Second Edition* (ASCE, 1996)
- *Low Impact Development Design Strategies: An Integrated Approach* (Maryland, 2001)



Documenting Your Design

There are two general approaches to managing site runoff.

The **integrated/distributed BMP** approach emphasizes "disconnection" of impervious areas from the drainage system and detention, infiltration, and treatment of runoff throughout the site. Detention and infiltration areas are sized and shaped to fit the available space. Maintenance requirements may be little more than what is required for normal landscaping. Low Impact Development, pioneered in Prince George's County, Maryland, exemplifies the integrated/distributed approach.

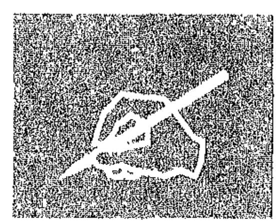
The **structural BMP** approach emphasizes the design of facilities that can retain, detain, and treat stormwater. Facilities are sized by engineering formulas to insure that a targeted proportion of sediment particles either settle or are filtered out of the runoff flow. The WEF/ASCE Manual of Practice, *Urban Runoff Quality Management*, exemplifies the structural BMP approach.

The two approaches are not exclusive and can be combined within one site.

In general, smaller BMPs distributed throughout the site look better and require less area. In addition, integrated/distributed BMPs are less likely to fail and may be less likely to create nuisances or safety hazards.

However, integrated/distributed BMPs are not individually engineered for each application. Therefore, for compliance purposes, it is necessary to account for the impervious area treated by each integrated/distributed BMP and show that the chosen suite of integrated/distributed BMPs will retain and treat the required proportion of total site runoff effectively.

The City of Milpitas has developed the following recommendations for selecting and documenting self-detaining areas, integrated/distributed BMPs and structural BMPs.



A **spreadsheet template**, in Microsoft Excel format, is provided for making calculations and presenting your submittal.

▶ SELECTING AND DOCUMENTING SELF-RETAINING AREAS AND BMPS

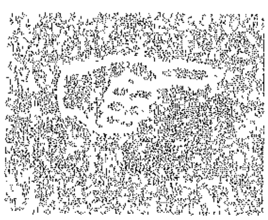
The required size of structural BMPs is proportionate to the total connected tributary area and the weighted imperviousness of that area. The best way to reduce the number and size of structural BMPs is to **disconnect portions of the tributary area** and remove these disconnected areas from the sizing calculation.

Pervious areas, including turf, landscaped areas, and pervious pavements, may be disconnected by designing them to **retain the design storm**. In effect, this means that they must retain the first ½-inch of rainfall.

Runoff from impervious areas (roofs and impervious pavements) can be **effectively disconnected** by routing runoff to planter boxes, bioretention areas, and other BMPs that are integrated into the landscaping. Simple factors may be used to size these **integrated/distributed BMPs.**

If the entire catchment area can be effectively disconnected, no **structural BMPs** are required. If some of the catchment area still produces runoff, structural BMPs are necessary, but the required size of the BMPs will be minimized.

Documentation requires identifying each self-detaining and non-self-detaining area within the catchment, identifying which non-self-detaining areas drain to integrated/distributed BMPs, and estimating the imperviousness of each remaining non-self-detaining area. This information is then used to size any required structural BMPs.



These recommendations are intended to facilitate, not substitute for, creative interplay among site design, landscape design, and drainage design. Several iterations may be needed to find the combination of self-retaining areas, integrated/distributed BMPs, and structural BMPs that provides the optimal aesthetics, circulation, and use of available area for your site.

To create self-retaining turf and landscape areas in flat areas or on terraced slopes, berm the area or depress the grade so that these areas will retain at least ½ inch of rainfall. Specify slopes, if any, toward the center of the area. Or slope toward berms sufficiently high to pond a volume equal to ½ inch times the entire area. (Note: landscape areas may also be appropriate locations for treatment BMPs.)

Equivalence

Retaining the first ½ inch of rainfall effectively disconnects an area from the drainage system for the purposes of the water quality design storm.

Areas covered with pervious pavement areas (e.g., crushed stone, pervious asphalt, or pervious concrete) can sometimes be handled similarly. Note that care must be taken to insure that sediment from landscaped or undeveloped areas does not wash on to the pervious pavement and cause clogging.

Table 1 in the accompanying spreadsheet (Appendix E) provides for documenting turf, landscape, pervious pavement, and other pervious areas.

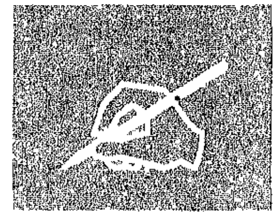


TABLE 5-1. ILLUSTRATION OF SPREADSHEET TABLE 1, for documenting pervious areas.

Area ID (as indicated on site drawing)	*Surface*	*Size (in SF) – Self-retaining areas*	*Size (in SF) – Non-self retaining areas*	*If non self-retaining, estimate runoff factor "C"*	*Size × C*
Total					

"C" Factors to be used for pervious areas

Turf	0.20
Landscape	0.20
Crushed aggregate	0.15
Pervious concrete	0.10
Pervious asphalt	0.10

Use this table to document all areas within the catchment that are not completely impervious. For non-self-retaining pervious areas only, select the appropriate runoff factor "C" and enter it on the spreadsheet.

To select integrated/distributed BMPs, first determine the impervious surface area that will drain to the BMP. Where possible, distribute drainage from opposite sides of driveways, opposite sides of buildings, and from different sections of parking lots to separate small BMPs located within landscaped areas. Integrated/distributed BMPs are best designed to serve impervious areas 15,000 square feet and smaller.

Then select a BMP type and apply the corresponding sizing factor to determine the required surface are of the BMP. Check that the required surface area can be accommodated within your site design, and redesign if necessary.

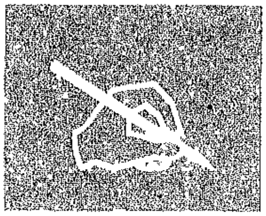


Table 2 in the accompanying spreadsheet (Appendix E) provides a way to document all impervious area within the catchment, document selection of integrated/distributed BMPs, and calculate of the required minimum surface area of each BMP.

TABLE 5-2. ILLUSTRATION OF SPREADSHEET TABLE 2,
for documenting impervious areas and treatment BMPs.

Impervious Area ID (as indicated on site drawing)	*Description (e.g., roof, parking lot, driveway)*	*Size (in SF)*	*BMP ID#*	*Area Served by BMP*	*Sizing Factor*	*Minimum required BMP Surface Area*	*Surface Area as Designed*
Total							

Sizing Factors

Landscape Swale	.045
Vegetated Filter	.045
Stormwater Planter	.045
Bioretention	.045
Sand Filter	.045

EQUIVALENCE

The 0.045 sizing factor is applicable to BMPs that infiltrate runoff from 100% impervious area at 0.2 inches per hour intensity through soil or sand with a minimum infiltration rate of 5 inches per hour. (0.2/5 = 0.04). The sizing factor of 0.045 incorporates a safety factor of 1.125.

Design requirements and details for integrated/distributed BMPs are described in the BMP Gallery beginning on page 49.

► SIZING STRUCTURAL BMPS

The runoff from the remaining area in each catchment – pervious areas that are not self-retaining, plus impervious areas that are not served by integrated/distributed BMPs – must be routed to a structural BMP.

As described in the RWQCB permit, structural BMPs are either **volume-based** or **flow-based.**

For some volume-based structural BMPs (e.g., detention basins and constructed wetlands) discharge is controlled by the size of the outlet orifice. Note that suitable outlet orifices cannot be designed for small flows; for this reason, these BMPs should only be used to treat impervious areas larger than 15,000 square feet.

Volume-based BMPs may be sized using either the WEF method or the California BMP method. The two methods are essentially equivalent; the City of Milpitas recommends the California BMP method. The California BMP method is simpler to apply.

To size a structural BMP using the California BMP method, first determine **the percent directly connected impervious area for the remaining area.** The percent directly connected impervious area is simply the remaining impervious area divided by the remaining total area. (Self-retaining areas and areas draining to integrated/distributed BMPs are not included.) If this remaining directly connected impervious area is less than 15,000 square feet, use an integrated/distributed BMP and size factor.

For larger areas, use the nomograph (Appendix F). Follow the horizontal 80% annual percent capture line until it intersects with the appropriate DCIA curve (interpolate if necessary). Then read down to the x-axis and pick off the corresponding unit basin storage volume in feet. Multiply this number times the **remaining area** to be treated. This is the required water quality volume in cubic feet.

The provided spreadsheet calculates the percent directly connected impervious area and total remaining area for you. Only the unit basin storage volume need be read from the nomograph and entered into the spreadsheet. The required water quality volume is calculated automatically.

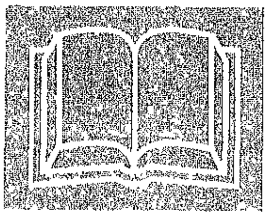
To determine the design flow for sand filters and other flow-based BMPs, first calculate the **percent imperviousness of the remaining area.** The percent imperviousness of the remaining area must be calculated by multiplying each component area by its respective runoff coefficient (or "C" factor), summing the products of that multiplication, and then dividing by the total remaining area. Next, multiply by the appropriate rainfall intensity (0.2 inches/hour). Divide by 43,200 to get the design minimum flow rate in cubic feet per second.

▶ USING GROUNDWATER INFILTRATION

Where there is sufficient slope, or where the City's storm drain system can be feasibly accessed, it will be possible to design most BMPs with an impermeable liner and underdrain system to limit infiltration to groundwater.

However, where the stormwater NPDES permit criteria can be met, it may be more cost effective – and environmentally beneficial – to allow infiltration. For BMPs that rely on infiltration, the following must be documented:

- Depth from the base of the BMP to groundwater is 10 feet or more.
- Soils are NRCS Type "A" or "B." Infiltration in NRCS Type "C" soils may be allowed if infiltration rates are documented and the design insures drawdown within 24 hours.



References and Resources

- *Start at the Source* (BASMAA, 1999) (runoff coefficients for pervious pavements)
- *Hydrology Handbook, Second Edition* (ASCE 1996) (runoff coefficients for unpaved areas).
- *Highway Design Manual* (California Department of Transportation, 2001). Chapter 8.
- *Portland Stormwater Management Manual* (City of Portland, 2002).
- City of Milpitas Soils Maps.
- City of Milpitas Groundwater Infiltration Evaluation.
- *USDA SCS Technical Release TR55*, Appendix A: Soil Types

Design Help

Start at the Source: Design Guidance Manual for Stormwater Quality Protection, published in 1999 by the Bay Area Stormwater Management Agencies Association (BASMAA), is an updated version of a manual first published in 1997. The 1999 edition covers planning and zoning, site design, and drainage systems. The manual also includes some details for site design, pervious pavements and landscaping, and BMPs.

Start at the Source is an excellent general design guide and is best consulted at the **beginning of the site design process.**

State and local governments elsewhere in the U.S. have developed more specific design details for BMPs. Portland, Oregon, developed the "simplified" design, using sizing factors, that is described above for selecting and sizing integrated/distributed BMPs. The City of Milpitas has selected and adapted some of Portland's design details. These details may be adapted for use with the following integrated/distributed BMPs:

- Landscape Swales
- Vegetative Filters
- Stormwater Planters
- Landscape Infiltration

- Sand Filters

In addition, the City of Milpitas encourages the use of bioretention areas. A typical design (excerpted from Prince Georges County, 1999) is included in the BMP Gallery. Designers should also consult USEPA's *Storm Water Technology Fact Sheet: Bioretention* (EPA 832-F-99-012, 1999).

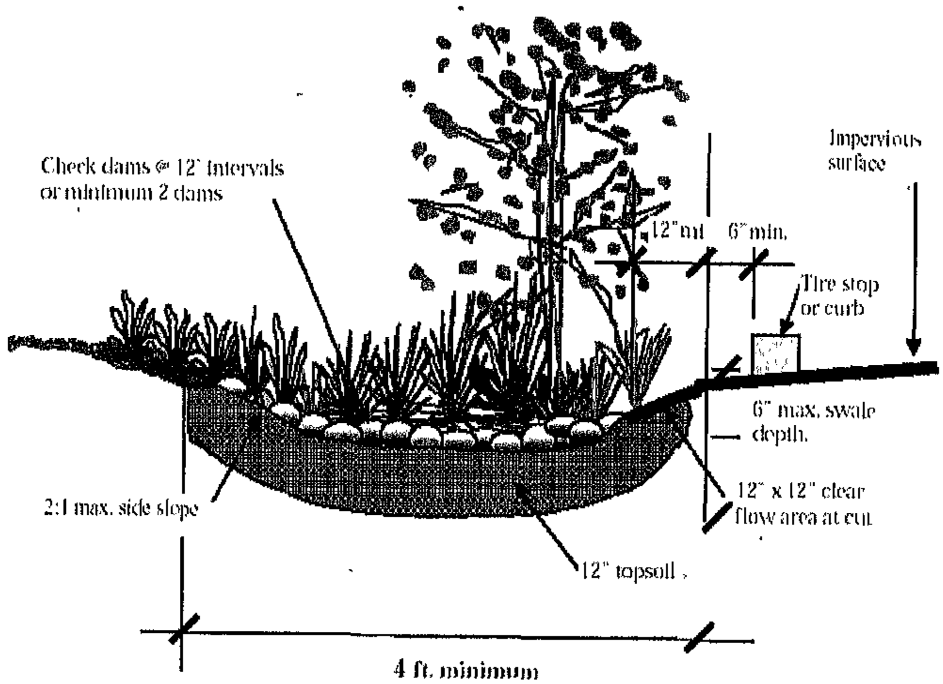
Most of these designs can be adapted to areas with low-permeability soils, shallow groundwater, or steep slopes by incorporating an impermeable liner and an underdrain system composed of drain rock and perforated drain pipe. Because the BMP may require 1' to 4' difference in elevation between the inlet and outlet, it is advisable to consider the requirements for these BMPs when preparing site plans and designing grading and drainage for the site.

For guidance on designing structural BMPs, see *Urban Runoff Quality Management* (WEF/ASCE, 1998) and the *California Stormwater BMP Handbooks* (SWQTF, 1993 or 2003 update).

BMP Gallery

The BMP designs on the following pages are intended for use with the sizing factors in Table 5-2. The designs are provided to assist you with developing a Stormwater Control Plan. More specific detailed drawings, showing construction materials and methods to be used, plumbing connections, etc., will be required with your application for a building permit. Some of these requirements appear in Appendix G. Check with the City of Milpitas Building Department for requirements that apply to your project.

► **LANDSCAPE SWALE**

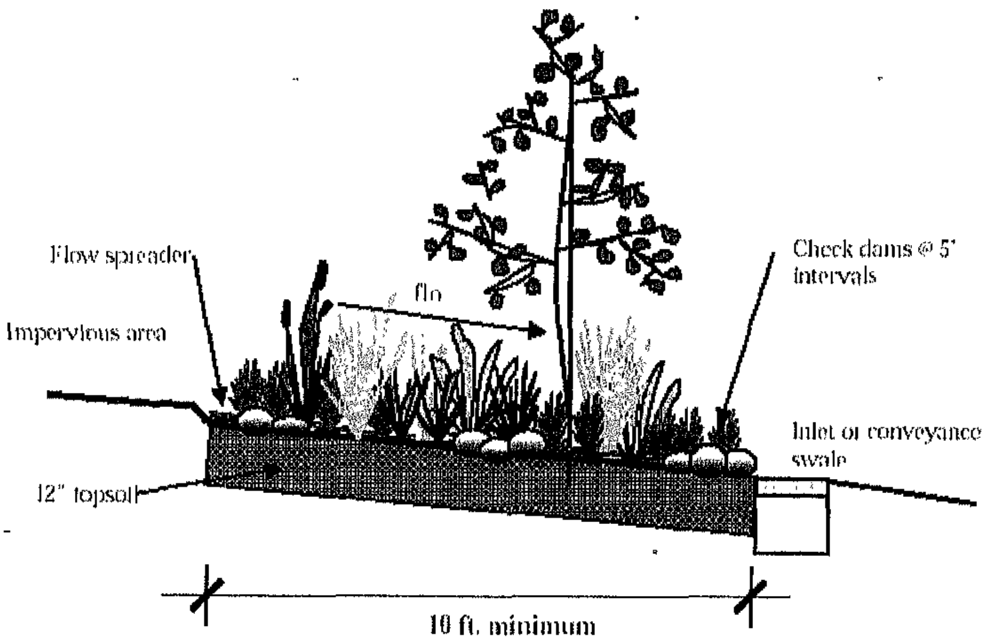


Section Not to Scale

Minimum length: 20 feet.
Maximum slope: 6%.
Soils in the top 12" to be equivalent to a sandy loam with a minimum infiltration rate of 5 inches/hour.
Irrigation required to maintain plant viability.
Check dams should extend the width of the swale, be 12" in length along the swale, 3"-5" high and constructed of rock, old brick, concrete, or similar.
No bypass required for larger storms.
Provide liner where depth to groundwater is less than 10'. Provide underdrain system in "D" soils or where liner is required.

Drawing courtesy City of Portland, OR.

▶ **VEGETATED FILTER**

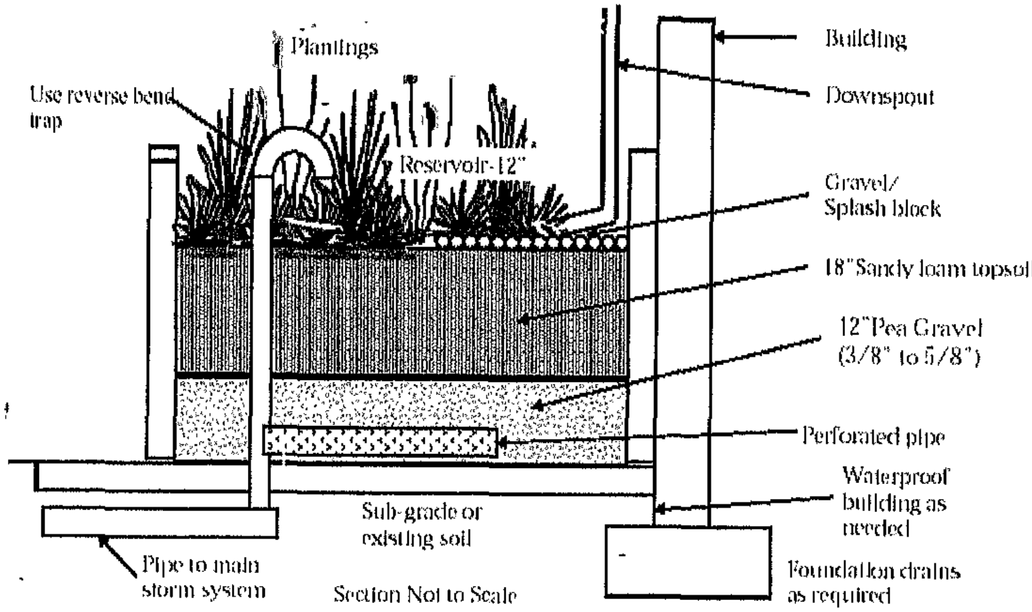


Section Not to Scale

Runoff must enter the filter as sheet flow (e.g. from a parking lot), or a flow spreader can be used to create sheet flow.
Use with any soil type; no underdrain required.
Soils in the top 12" to be equivalent to a sandy loam with a minimum infiltration rate of 5 inches/hour.
Minimum length: 10 feet.
Minimum width: 20 feet.
Maximum slope: 10%.
Irrigation required to maintain plant viability.
Check dams should extend the width of the swale, be 12" in length along the swale, 3"-5" high, and constructed of rock, old brick, concrete, or similar.

Drawing courtesy City of Portland, OR.

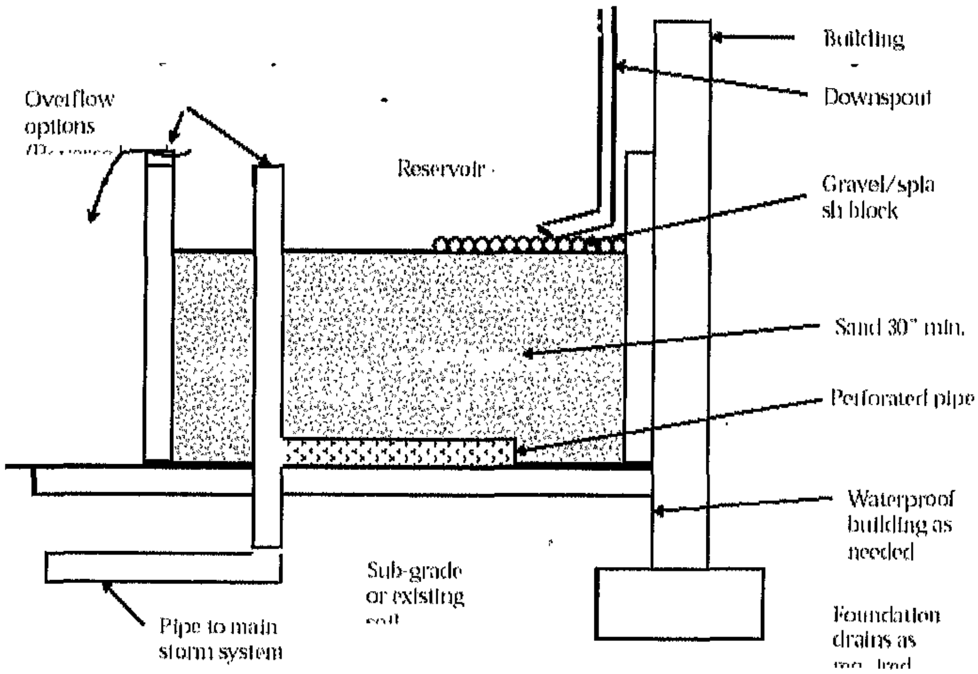
▶ **STORMWATER PLANTER**



Can be used in any soil type (A,B,C,D). Can be used adjacent to building and within setback area.
Sandy loam topsoil to have a minimum infiltration rate of 5 inches/hour.
Minimum width: 18".
Minimum length: none.
May be constructed of concrete, stone, or other durable material. Monolithic precast concrete recommended.
Irrigation required to maintain plant viability.
Install filter fabric between soil and gravel underdrain and around perforated pipe.
Size overflow trap for building code design storm; set trap below top of box.
Planter wall set against building should be higher to avoid overflow to that side.

Drawing courtesy City of Portland, OR.

▶ SAND FILTER

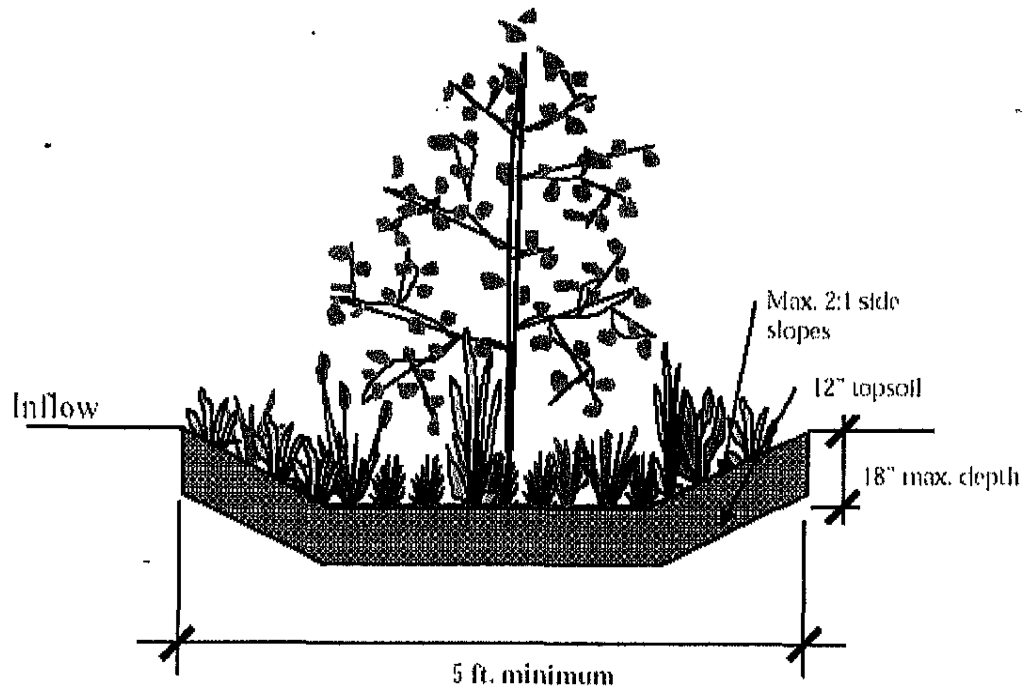


Section Not to Scale

Can be used in any soil type (A,B,C,D). Sand to have a minimum infiltration rate of 5 inches/hour.
Can be used adjacent to building and within setback area.
Can be used above or below grade.
Install filter fabric between soil and gravel underdrain and around perforated pipe.
Size overflow trap for building code design storm; set trap below top of box.
Planter wall set against building should be higher to avoid overflow to that side.

Drawing courtesy City of Portland, OR.

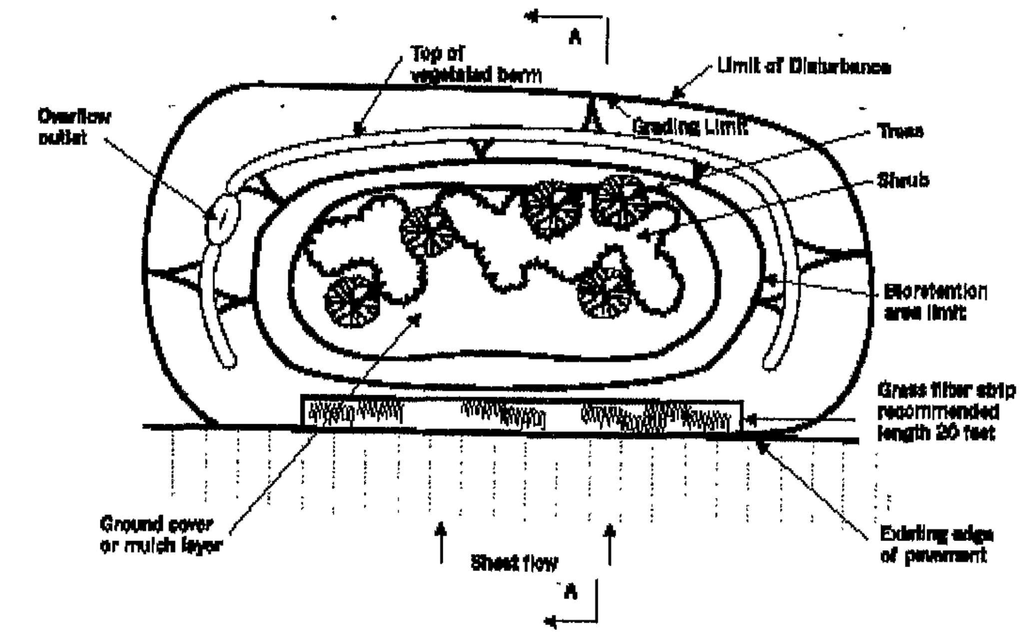
▶ **LANDSCAPE INFILTRATION/BIORETENTION**



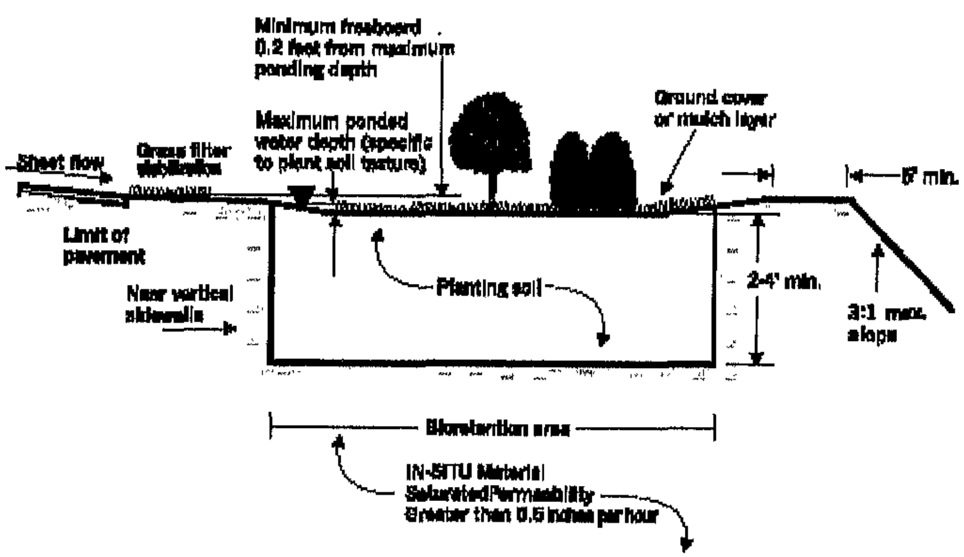
Section Not to Scale

Minimum storage depth: 6"
Maximum storage depth: 18"
Maximum side slope: 2:1.
Minimum bottom width: 3 '
Plantings may include trees, shrubs, grasses or turfgrasses suitable for periodic inundation. Irrigation required to maintain plant viability.
Soils in the top 12" to be equivalent to a sandy loam with a minimum infiltration rate of 5 inches/hour.
Provide liner where depth to groundwater is less than 10'. Provide underdrain system in "D" soils or where liner is required.

▶ BIORETENTION



Plan view (not to scale)



Section A-A (not to scale)

Planting soil to be equivalent to a sandy loam with a minimum infiltration rate of 5 inches/hour. Plantings may include trees, shrubs, grasses or turfgrasses suitable for periodic inundation. Irrigation required to maintain plant viability. Provide liner where depth to groundwater is less than 10'. Provide underdrain system in "D" soils or where liner is required. *Drawing courtesy Prince George's County, MD.*

Chapter 6

BMP Maintenance

Identify the maintenance needs for the treatment BMPs on your site.

Treatment BMPs must be regularly maintained to insure that they continue to be effective and that they do not cause flooding, harbor vectors, or otherwise cause a nuisance. This chapter describes general maintenance requirements for typical BMPs.

BMP maintenance is the responsibility of the property owner. The City will periodically inspect the site to verify maintenance of treatment BMPs.

Create your BMP maintenance plan in two stages. In the first stage, identify typical maintenance requirements for the BMPs you have selected for your site. Include this information in your **Stormwater Control Plan.**

In the second stage, schedule specific maintenance activities for each BMP, including one-time or frequent maintenance and inspections to occur during the first months or years after construction. This **Stormwater Control Operation and Maintenance Plan** – along with the project developer's signed statement accepting responsibility for maintenance until the responsibility is legally transferred to the owner – must be submitted before the building permit is final.

The City will implement a Stormwater Control Operation and Maintenance Verification Program, which will include periodic inspections. The program is described in Appendix H. Example Stormwater Control Operation and Maintenance Plans are in Appendix I.

Typical BMP Maintenance Requirements

Following are typical maintenance requirements for some common treatment BMPs. You can use this information to prepare your Stormwater Control Plan.

▶ VEGETATED FILTERS, SWALES, AND BIORETENTION AREAS

These BMPs remove pollutants primarily by filtering runoff slowly through an active layer of soil. Routine maintenance is needed to insure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active. Typical maintenance consists of the following:

- Inspect **inlets** for channels, exposure of soils, or other evidence of erosion. Clear any obstructions and remove any accumulation of sediment. Examine rock or other material used as a splash pad and replenish if necessary.
- Inspect **outlets** for erosion or plugging.
- Inspect **side slopes** for evidence of instability or erosion and correct as necessary.
- Observe soil at the bottom of the swale or filter for uniform **percolation** throughout. If portions of the swale or filter do not drain within 48 hours after the end of a storm, the soil should be tilled and replanted. Remove any debris or accumulations of sediment.
- Confirm that **check dams** and **flow spreaders** are in place and level and that channelization within the swale or filter is effectively prevented.
- Examine the **vegetation** to insure that it is healthy and dense enough to provide filtering and to protect soils from erosion. Replenish mulch as necessary, remove fallen leaves and debris, prune large shrubs or trees, and mow turf areas. Confirm that irrigation is adequate and not excessive. Replace dead plants and remove invasive vegetation.
- Abate any potential **vectors** by filling holes in the ground in and around the swale and by insuring that there are no areas where water stands longer than 48 hours following a storm. If mosquito larvae are present and persistent, contact the Santa Clara County Vector Control District for information and advice. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.

▶ PLANTER BOXES

Planter boxes capture runoff from downspouts or sheet flow from plazas and paved areas. The runoff briefly floods the surface of the box and then percolates through an active soil layer to drain rock below. Typical maintenance consists of the following:

- Examine **downspouts** from rooftops or sheet flow from paving to insure that flow to the planter is unimpeded. Remove any debris and repair any damaged pipes. Check splash blocks or rocks and repair, replace, or replenish as necessary.

- Examine the **overflow** pipe to make sure that it can safely convey excess flows to a storm drain. Repair or replace any damaged or disconnected piping.

- Check the **underdrain** piping to make sure it is intact and unobstructed.

- Observe the **structure** of the box and fix any holes, cracks, rotting, or failure.

- Check that the **soil** is at the appropriate depth to allow a 12" reservoir above the soil surface and is sufficient to effectively filter stormwater. Remove any accumulations of sediment, litter, and debris. Confirm that soil is not clogging and that the planter will drain within 3-4 hours after a storm event.

- Determine whether the **vegetation** is dense and healthy. Replace dead plants. Prune or remove any overgrown plants or shrubs that may interfere with planter operation. Clean up fallen leaves or debris and replenish mulch. Remove any nuisance or invasive vegetation.

▶ SAND FILTERS

Sand filters remove pollutants by physical settling and adsorption as runoff flows through the granular media. Unlike the soil in planter boxes and vegetative filters, the sand does not support soil organisms that keep the medium mixed and adsorptive. Sand filters may be more prone to blinding (development of an impermeable surface layer) and clogging (accumulations of clayey sediments deeper in the filter).

Typical maintenance consists of the following:

- Check **inlets**. Remove any accumulated sediment or debris. Examine splash blocks or rock and replace or replenish as needed.

- Insure that the **overflow** pipe or **spill** point is clear and can convey excess flows to storm drains. Look for any evidence of channeling or erosion. Replace or replenish rocks or armoring.

- Observe the **structure** of the filter and fix any holes, cracks, or failure.

- Look at the **sand** to insure that the level allows a 12" reservoir above the surface. Remove any debris or accumulated sediment. Confirm that the surface of the sand is not blinded by fine sediment. If it is, remove and replace the top layer of sand. Check that the filter as a whole is not clogged. If it is, all media may need to be removed and replaced. If no blinding or clogging is apparent, rake the surface of the sand.

- Check the **underdrain** piping to make sure it is intact and unobstructed.

▶ WET, EXTENDED WET DETENTION, AND DRY DETENTION PONDS

These larger-scale BMPs remove pollutants by detaining runoff in a quiescent pool long enough for some of the particulates to settle to the bottom. They require both routine (preventative) maintenance and non-routine maintenance.

Typical routine maintenance consists of the following:

- Examine **inlets** to insure that piping is intact and not plugged. Remove accumulated sediment or debris near the inlet.

- Examine **outlets** and **overflow structures** and remove any debris or sediment that could plug the outlets. Identify and correct any sources of sediment and debris. Check rocks or other armoring and replace as necessary.

- Inspect **embankments**, dikes, berms, and side slopes for signs of erosion or structural deficiencies.

- Confirm that any **fences** around the facility are secure.

- Control **vectors** by filling any holes in or around the pond and examine the pond for evidence of mosquito larvae.

Typical non-routine maintenance includes the following:

- **Dredge** accumulated sediment. This may be required every five to 15 years, and more frequently if there are excess sources of sediment (as may occur on newly constructed sites where soils are not yet stabilized). Dredging is usually a major project requiring mechanized equipment. The work will include an initial survey of depths and elevations, sediment sampling and testing, removal, transport, and disposal of accumulated sediment, and reestablishment of original design grades and sections.

- Remove **invasive plants.** Depending on the success of the design and the rate of sedimentation, ponds may be subject to excessive growth of rooted macrophytes, which reduce the effective area of the pond and create quiescent surface water that supports mosquito larvae. Removal may require a similar level of effort to dredging.

References and Resources

- *Start at the Source* (BASMAA, 1999) pp. 139-145.
- *Urban Runoff Quality Management* (WEF/ASCE, 1998). pp 186-189.
- *Stormwater Management Manual* (Portland, 2002). Chapter 6.0.
- *California Storm Water Best Management Practice Handbooks – Municipal* (Storm Water Quality Task Force, 1993).
- *Best Management Practices Guide* (Public Telecommunications Center for Hampton Roads, 2002).

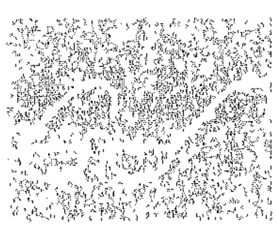
Chapter

Alternative Compliance Options

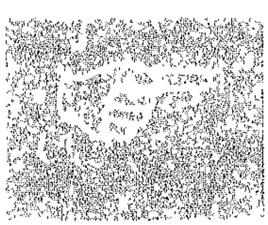
Alternatives for meeting stormwater control requirements for your site by by participating in a regional stormwater facility, by implementing compensatory mitigation, or obtaining an exemption.

Instead of incorporating treatment BMPs into your site plan, you may pursue one of three "alternative compliance" options.

You may:



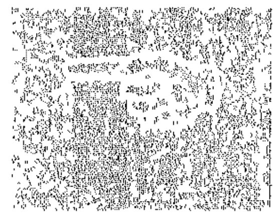
1. Participate in a **regional stormwater treatment facility**, or
2. Demonstrate the **impracticability** of incorporating treatment BMPs on your development site and also demonstrate how you will provide **compensatory mitigation** (equivalent treatment or equivalent water-quality benefit) at another site, or
3. Obtain an **exemption** from the requirements if your project meets specific criteria set by the RWQCB.



ICON KEY
Helpful Tip
Submittal Requirement
Terms to Look Up
References & Resources

The requirements for and availability of each of these options are being developed by the City. Some details are subject to RWQCB review. The City's process and criteria for approval are also subject to change. For these reasons, **proposing an off-site option for C.3 compliance could substantially delay review of your application for planning and zoning approval.**

If you are considering whether to propose an alternative compliance option for your project, the City strongly encourages you to schedule a pre-application meeting with City staff where you can discuss application requirements.



The "alternative compliance" or "off-site" options authorize alternative means to comply with the RWQCB's requirement for on-site stormwater treatment BMPs. However, **other C.3 requirements – including structural source control BMPs – must still be implemented on-site.** In addition, the "off-site" options described in this chapter do not apply to the requirements of Provision C.3.f., "Limitation on Increase of Peak Stormwater Runoff Discharge Rates." SCVURPPP will propose how Provision C.3.f should apply to specific locations and to specific types of projects when it submits the Hydromodification Management Plan (HMP) to the RWQCB. (Submittal is scheduled for October 2003).

This chapter has two sections. The first section describes, for each option, current regulatory requirements, the status (availability) of the option, and related uncertainties. The second section describes, step-by-step, how to prepare your rationale for using alternative C.3 compliance and how to document your request in your application for planning and zoning approval.

Regulatory Requirements, Status, & Uncertainties

The RWQCB's NPDES permit allows Milpitas and other Santa Clara Valley agencies to establish a "waiver" program. In the absence of a waiver program, the City may grant "interim" waivers. Limitations of and requirements for the waiver program and interim waivers are prescribed in permit provision C.3.g.

▶ OPTION 1: REGIONAL TREATMENT FACILITY

Under provision C.3.g (ii), the City's program may allow an applicant to participate in a regional or watershed stormwater facility instead of incorporating on-site treatment BMPs. Where feasible, the regional facility should discharge to the same stream or other receiving water.

Changing Requirements

In February 2003, the RWQCB adopted C.3 requirements for Alameda, Contra Costa, and San Mateo County municipalities. Those requirements include more flexibility and allow exemptions for certain affordable housing or brownfields projects.

The RWQCB's Executive Officer says Santa Clara Valley municipalities will receive equivalent consideration when the RWQCB reviews their proposed waiver programs.

Status: This option could become available to project applicants if the City, SCVWD, or another public or private entity proposes and plans a regional facility. SCVWD is planning regional stormwater treatment facilities. The City owns flood management lagoons that could potentially be operated for, or retrofitted to provide, stormwater treatment.

Once the RWQCB accepts the City's waiver program, applicants may propose participation in regional treatment facilities without first showing that it is impracticable to implement on-site treatment BMPs. Until that time, applications for interim waivers must demonstrate impracticability of on-site treatment as well as showing an acceptable level of participation in a regional facility. Under an interim waiver, the regional treatment facility must be established and operating within six months of project construction.

Uncertainties: There is no timetable for creating regional treatment facilities. It is not clear what fiscal or legal mechanism a project applicant could use to commit to, or contribute to, future regional facilities. There is, as yet, no established basis to calculate the required monetary contribution or other form of participation in a regional facility that would correspond to a specific project.

▶ OPTION 2: IMPRACTICABILITY AND COMPENSATORY MITIGATION

Under provision C.3.g (i), the City's waiver program may allow an applicant to show (1) impracticability of on-site treatment controls **and** (2) how the applicant will provide compensatory mitigation.

Impracticability means that there are conditions and characteristics peculiar to a site or project that make on-site treatment controls technically infeasible or excessively costly.

Compensatory mitigation can be demonstrated by showing (1) treatment of runoff from an equivalent or greater amount of impervious area, (2) treatment of an equivalent or greater quantity of runoff pollutants, or (3) other water-quality benefit.

Status: The City's waiver program will include this option. In the interim before the waiver program is accepted by the RWQCB, interim waiver applications must also show that treatment BMPs at the alternative site will be established and operating within six months of construction of the applicant's project. Water-quality-benefit projects other than treatment BMPs must be specifically approved by the RWQCB's Executive Officer.

Uncertainties: The RWQCB permit requires the City to state, in its proposal for a waiver program, criteria for impracticability and methods for establishing and tracking equivalent water quality benefits. The City has not yet created or adopted these criteria or methods. The RWQCB has not yet reviewed or commented on any waiver program proposal, so no precedents or examples of acceptable criteria exist.

▶ OPTION 3: EXEMPTION BASED ON PROJECT TYPE

Under this option, you may apply for exemption from requirements for treatment controls if your project meets specific criteria.

The types of projects eligible for exemption are "redevelopment" projects – projects on previously developed sites that result in the addition or replacement of impervious surface. To be eligible for exemption, the projects must also be one of the following three types:

1. "Brownfield sites" – sites where expansion, development or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

2. Creation of housing units affordable to persons of low or moderate income. "Low and moderate income" is defined in Health and Safety Code Section 50093.

3. Transit-village type developments. The characteristics of transit village developments are addressed in California Government Code 65460, "The Transit Village Planning Act of 1994."

To be eligible for exemption, the applicant must also show:

- On-site treatment BMPs are impracticable, and

- The cost of participation in a regional treatment facility or a project to provide equivalent water-quality benefit would unduly burden the project.

Status: Provisions for exemption will be included in the City's proposed waiver program. In particular, the City seeks to exempt transit-oriented developments within the Midtown Specific Plan area. There are no provisions for exemptions in the interim before the waiver program is approved by the RWQCB.

Uncertainties: Criteria for impracticability have not been established. It is not clear how these criteria might apply in the special case of redeveloping sites that are already impervious. There is not yet any established way to determine if the costs of off-site mitigation would "unduly burden" a project.

Step by Step

The City has not yet created a waiver program. However, the following step-by-step procedure will help you choose among the three alternative compliance options and will also help you begin preparing the documentation that will be required if you incorporate alternative compliance into your planning and zoning application.

Step 1: Review on-site compliance options

Before deciding to apply for participation in a regional facility, for a waiver with compensatory mitigation, or for an exemption, you should prepare (at least in draft form) a Stormwater Control Plan for the project. You will need much of this same information as part of your application for alternative compliance.

See the steps in Chapter 3. As described in that Chapter, assemble needed information, consider constraints and opportunities, and design the site to minimize imperviousness.

Consider whether it is possible to incorporate integrated/distributed treatment BMPs – such as stormwater planters, underdrained swales, and biofilters – into the site, despite site-specific conditions such as space constraints or a lack of subsurface drainage.

Incorporate any needed source control BMPs into your project design. **On-site source control BMPs are required for specified on-site sources even when an alternative compliance option is used.**

Examine your draft Stormwater Control Plan for:

- Site characteristics that limit the use of treatment BMPs.
- Ways that these site characteristics make the use of treatment BMPs technically complicated and potentially unworkable.
- Ways that site characteristics add to the cost of treatment BMPs.

Step 2: Review Alternative Compliance Options

Review the "regulatory requirements, status, and uncertainties" section earlier in this chapter and consider how each of the alternative compliance options may apply to your project. For example:

Option 1, Regional Facility: Is such a facility planned in your site's watershed or in a nearby watershed? Is there a feasible and reasonable way to "buy-in" or participate in such a facility? If so, have the costs of participation, or the basis for determining those costs, been established? If the participation will precede the City's waiver program, can you also demonstrate that on-site treatment is impracticable? Will the regional facility be operating within 6 months of the time you complete your project?

Option 2, Impracticability and Compensatory Mitigation: Can you demonstrate the impracticability of on-site treatment controls? Is there an off-site project where treatment controls could be applied to an equivalent amount of impervious area or to treat exceptionally polluted runoff? Or is there a stream restoration or similar project that provides an opportunity to obtain exceptional water-quality benefits at reasonable costs?

Option 3, Exemption Based on Project Type: Is your project a "redevelopment" project? Is it also a brownfield project, an affordable housing project, or a "transit village-type development"? If so, can you also demonstrate that on-site controls are impracticable and that participating in an off-site compensatory mitigation project would "unduly burden" your project?

Step 3: Are on-site BMPs impracticable?

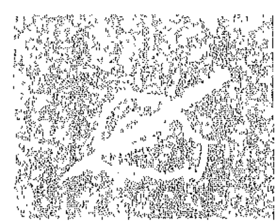
This step is required for Option 2 (impracticability and compensatory mitigation) and for Option 3 (exemption based on project type). It is not required for Option 1 (participation in a regional facility) unless you make your application during the initial period before the City's waiver program is approved by the RWQCB (i.e., an "interim waiver").

To document impracticability, identify the aspects of your project or site that differentiate it from projects where on-site treatment controls have proven to be feasible. In general, one factor alone – such as steep slopes, unstable slopes, lot coverage, impermeable soils, or lack of hydraulic head – is not sufficient to demonstrate impracticability. However, when combined with a special circumstance, these factors can potentially make the use of treatment BMPs either:

- Technically infeasible, or
- Excessively costly.

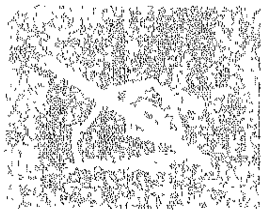
To demonstrate infeasibility or excessive cost, use examples and hypothetical treatment designs to show why various treatment BMP strategies (e.g., detention, infiltration, and integrated/distributed BMPs) cannot be applied to the site.

Step 4: Develop and document off-site options



This step is required for Option 1 (participation in a regional facility) and for Option 2 (impracticability and compensatory mitigation). Applicants for Option 3 must show that the costs of implementing or participating in available off-site options would "unduly burden" their project (i.e., make it not viable financially).

▶ DESCRIBE THE OFF-SITE PROJECT



Document the following information for the regional facility or compensatory mitigation project:

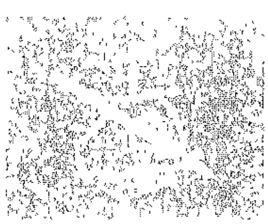
- Project location and relevance to local watershed.
- Project size, uses, and description.
- Project status and schedule.

For a compensatory mitigation project that involves the installation of treatment BMPs at another site, include:

- The impervious area that will be served by new treatment BMPs.
- A comparison of the potential for pollutants to enter stormwater at the project site and the compensatory mitigation site.

For an "equivalent water-quality benefit" project (i.e., a compensatory mitigation project that does not use treatment BMPs), include a general description of the project and the expected water quality benefits.

▶ DEMONSTRATE THAT THE OFF-SITE PROJECT HAS EQUIVALENT BENEFITS



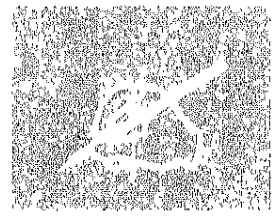
Explain the basis and provide a rationale for why the alternative compliance project will provide an equal or greater water-quality benefit than incorporating treatment BMPs into the project design. Possible rationales include:

- The alternative compliance project will treat more impervious area than would be served by on-site treatment BMPs.
- The pollutants removed at the alternative compliance site are greater in quantity, or are more of a threat to beneficial uses of creeks, wetlands, or the Bay, compared to the pollutants that would be removed by on-site treatment BMPs.
- The alternative compliance project provides some other benefit to aquatic habitat, recreation, or other beneficial use that outweighs the benefits of on-site treatment BMPs.

Confirm that the off-site project is not otherwise required for C.3. compliance.

Step 5: Document eligibility for exemption

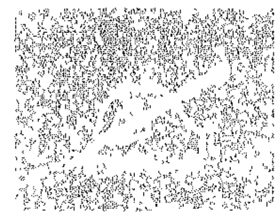
This step is required for applicants for Option 3 (exemption based on project type).



▶ DOCUMENT THAT YOUR PROJECT SITE WAS PREVIOUSLY DEVELOPED.

State the square footage of impervious area that exists on the site prior to redevelopment, the amount of this area that will be rebuilt or replaced, and the amount of new impervious area that will cover previously unbuilt areas.

▶ DOCUMENT YOUR PROJECT TYPE

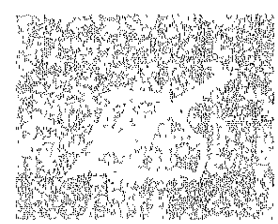


Document that your project meets one of the following three criteria:

1. The project is a brownfield. Describe the pollutants present, the severity and extent of groundwater or soil pollution, and the history of the pollutants' effects on previous efforts to develop the site.

2. The project is an affordable housing project. Incorporate or refer to any related documentation that qualifies the project as affordable housing. In particular, state how the project and resident qualifications are structured to insure that the housing will serve individuals and families within the income levels stated in Health and Safety Code Section 50093.

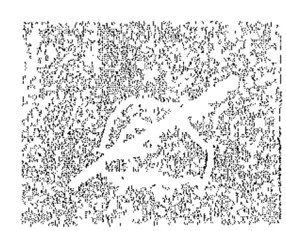
3. The project is part of a transit village. Incorporate or refer to related documentation that establishes the project as a transit village.



▶ DOCUMENT "UNDUE BURDEN".

Describe the key characteristics of project financing and economics that make the cost of participation in available regional facilities or compensatory mitigation projects financially not feasible for this project.

Step 6: Draft Alternative Compliance Proposal



Compile the documentation and rationale prepared in Steps 1 – 5 into a proposal to be submitted along with your application for Planning and Zoning approval. This proposal will provide the basis for the City's determination of whether your project meets the requirements for alternative compliance.

The proposal will also become part of the City's documentation that City planning review procedures are consistent with the RWQCB permit.

The City encourages you to submit a draft version of your proposal for preliminary staff review, discussion, and comment.

City staff may use the following checklist in reviewing your alternative compliance proposal.

References and Resources

- RWQCB Order 01-119, Provision C.3.g.
- RWQCB Order R2-2003-0021, (Alameda County Clean Water Program), Provision C.3.g.
- California Health and Safety Code Section 50093.
- California Government Code Section 65460 *et seq.*
- *City of Milpitas Waiver Program* (submittal to RWQCB, in preparation).

CHECKLIST FOR ALTERNATIVE COMPLIANCE PROPOSALS

For specific requirements, see the text, Provision C.3.g. in the RWQCB permit, and the City's waiver program.

▶ OPTION 1: REGIONAL FACILITY

- ☑ The project includes all required source control BMPs.
- ☑ Infeasibility of on-site treatment BMPs has been established.[1]
- ☑ A regional facility exists or is to be constructed.
- ☑ The regional facility will be operating within six months of project construction.[1]
- ☑ The applicant's participation in the regional facility insures that:
  - ☐ All stormwater from the site will be treated, or
  - ☐ An equivalent amount of stormwater that would otherwise be untreated will be treated.

▶ OPTION 2: COMPENSATORY MITIGATION

- ☑ The project includes all required source control BMPs.
- ☑ Infeasibility of on-site treatment BMPs has been established.
- ☑ The alternative project is adequately described and is feasible.
- ☑ The proposal demonstrates one of the following three conditions:
  - ☐ The alternative project treats an equal or greater amount of impervious area.
  - ☐ The alternative project will remove an equal or greater quantity of pollutants.
  - ☐ The alternative project provides other equivalent or greater water quality benefit.[2]
- ☑ The alternative project is not otherwise required for NPDES compliance.

▶ OPTION 3: EXEMPTION[3]

- ☑ The project includes all required source control BMPs.
- ☑ Infeasibility of on-site treatment BMPs has been established.
- ☑ The project is either:
  - ☐ A brownfield, or
  - ☐ Affordable housing, or
  - ☐ A transit village.
- ☑ Financial participation in an alternative compliance (off-site) project would create an undue burden on the project.

1. Required if application is considered before the Milpitas waiver program is approved by the RWQCB.

2. Must be specifically approved by the RWQCB Executive Officer if application is considered before the Milpitas waiver program is approved by the RWQCB.

3. Available only after the Milpitas waiver program is approved by the RWQCB.

Bibliography

ASCE. 1996. American Society of Civil Engineers. *Hydrology Handbook, Second Edition.* ASCE Manuals and Reports on Engineering Practice No. 28. ISBN 0-7844-0138-1. 784 pp.

Barr Engineering. 2001. *Minnesota Urban Small Sites BMP Manual.* Access: www.metrocouncil.org/environment/Watershed/bmp/manual.htm

BASMAA. 1999. Bay Area Stormwater Management Agencies Association. *Start at the Source: Design Guidance Manual for Stormwater Quality.* Tom Richman and Associates. 154 pp. plus appendix. Access: BASMAA 510-622-4265. Flyer: 56 KB Acrobat file.

Bass, Ronald E., Albert I. Herson, and Kenneth M. Bogdan. *CEQA Deskbook.* 1999 (Second) Edition. Includes 2001 Supplement. Solano Press Books, Point Arena, CA. 414 pp. plus appendices.

California. *California Environmental Quality Act, Statutes and Guidelines.* Access: http://ceres.ca.gov/ceqa/

California Department of Transportation. 2001. *Highway Design Manual.* Access: http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm Chapter 8 Access: 574 KB Acrobat file.

Federal Interagency Stream Restoration Working Group. 1998. *Stream Restoration: Principles, Processes, and Practices.* Access: 32.5 MB Acrobat file.

Hampton Roads, VA. 2002. *Best Management Practices Guide.* Public Telecommunications Center. Access: 7 Acrobat files

City of Milpitas. 2001. *Coyote Creek Trail Public Draft Initial Study.*

City of Milpitas. 1994. *City of Milpitas General Plan.* Access: 327 KB Acrobat file.

City of Milpitas *Municipal Code. Title XI, Chapter 10: Zoning.* Access: http://municipalcodes.lexisnexis.com/codes/milpitas/

Natural Lands Trust. 2001. *Growing Greener: Conservation by Design.* Produced in cooperation with the Pennsylvania Department of Conservation and Natural Resources and the Governor's Center for Local Government Services. September 2001. 20pp. Access: 1.7 MB Acrobat file.

OPR. 1994. Governor's Office of Planning and Research. *Thresholds of Significance: Criteria for Defining Environmental Significance.* CEQA Technical Advice Series. Sacramento, CA.

OPR. 2000. Governor's Office of Planning and Research. *2000 Planning Zoning and Development Laws.* Sacramento, CA 328 pp. Access: 1.8 MB Acrobat file.

Maryland, 1999. Prince George's County, Maryland. *Low-Impact Development Design Strategies: An Integrated Design Approach.* Department of Environmental Resources, Programs and Planning Division. June 1999. 150 pp. Access: 8.7 MB Acrobat file.

Riley, Ann. 1998. *Restoring Streams in Cities.* Island Press, Washington, DC. 425 pp.

RWQCB. 2001. California Regional Water Quality Control Board for the San Francisco Bay Region. Revised Order 01-024, NPDES Permit No. CAS029718, reissuing Waste Discharge Requirements for: Santa Clara Valley Water District, County of Santa Clara, City of Campbell, City of Cupertino, City of Los Altos; Town of Los Altos Hills, Town of Los Gatos, City of Milpitas, City of Monte Sereno, City of Mountain View, City of Palo Alto, City of San Jose, City of Santa Clara, City of Saratoga, and City of Sunnyvale, which have joined together to form the Santa Clara Valley Urban Runoff Pollution Prevention Program. 27 pp. Access: 205 KB Word file.

RWQCB. 2001. California Regional Water Quality Control Board for the San Francisco Bay Region. Order No. 01-119, NPDES Permit No. CAS 029718. Amendment Revising Provision C.3. of Order No. 01-024. 21 pp. Access: 250 KB Word file.

RWQCB. 2002. California Regional Water Quality Control Board for the San Francisco Bay Region. Fact Sheet on New Development Provisions. 3 pp. Access: 1.9 MB Acrobat file.

RWQCB. 2003. California Regional Water Quality Control Board for the San Francisco Bay Region. Order R2-2003-0021, (Alameda County Clean Water Program), Reissuing Waste Discharge Requirements for the Cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oaland, Piedmont, Pleasanton, San Leandro, Union City, Alameda County (Unincorporated Area), the Alameda County Flood Control and Water Conservation District, and Zone 7 of the Alameda County Flood Control and Water Conservation District, which have joined together to form the Alameda Countywide Clean Water Program. 46pp. + attachments. Access: 383KB Word file.

Santa Clara County Department of Environmental Health. *Pool Plan Check Guidelines* and *Spa Plan Check Guidelines.* Access: http://www.sccgov.org.

Schueler, Tom. 1995. *Site Planning for Urban Stream Protection.* Environmental Land Planning Series. Metropolitan Washington Council of Governments. 232 pp. Access: 8 Acrobat files.

SCBWMI. 2001. Santa Clara Basin Watershed Management Initiative. *Watershed Characteristics Report.* www.scbwmi.org. Access: 3.2 MB Acrobat file

SCBWMI. 2003. Santa Clara Basin Watershed Management Initiative. *Watershed Action Plan.* In preparation.

SCVURPPP. 1997. Santa Clara Valley Urban Runoff Pollution Prevention Program. *Urban Runoff Management Plan.* 74 pp. Access: 255 KB Acrobat file.

SCVURPPP. 2002. Santa Clara Valley Urban Runoff Pollution Prevention Program. *Hydromodification Management Plan Literature Review.* Geosyntec Consultants, Walnut Creek. Access: 1.4 MB Acrobat file.

SCVURPPP. 2002. Santa Clara Valley Urban Runoff Pollution Prevention Program. *Landscape Maintenance for Pest Reduction.* Fact Sheet, 2 pp. Access: 108 KB Word file.

SCVURPPP. 2002. Santa Clara Valley Urban Runoff Pollution Prevention Program. *Hydromodification Management Plan Revised Work Plan.* September 13, 2002. 8 pp. Geosyntec Consultants, Walnut Creek. Access: 35 KB Acrobat file.

SCVURPPP. 2003. Santa Clara Valley Urban Runoff Pollution Prevention Program. *Model Performance Standard for New Development Planning Procedures.* 15 pp. February 10, 2003. Access: 141 KB Word file.

Storm Water Quality Task Force. 1993. *California Storm Water Best Management Practice Handbooks: Munciipal, Industrial, and Construction Activity.* Prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe Associates, and Resources Planning Associates. March 1993. Access: Order from BPS in Oakland: 510-287-5485. Order form: 49 KB Acrobat file.

United States Department of Agriculture. 1986. *Technical Release 55 Documentation: Urban Hydrology for Small Watersheds.* Natural Resources Conservation Service, Conservation Engineering Division. 164 pp. Access: 2.5 MB Acrobat file.

WEF/ASCE. 1998. Water Environment Foundation/American Society of Civil Engineers. Urban Runoff Quality Management. WEF Manual of Practice No. 23, ASCE Manual and Report on Engineering Practice No. 87. ISBN 1-57278-039-8 ISBN 0-7844-0174-8. 259 pp. Access: Order from WEF or ASCE, www.wef.org or www.asce.org.

APPENDIX A

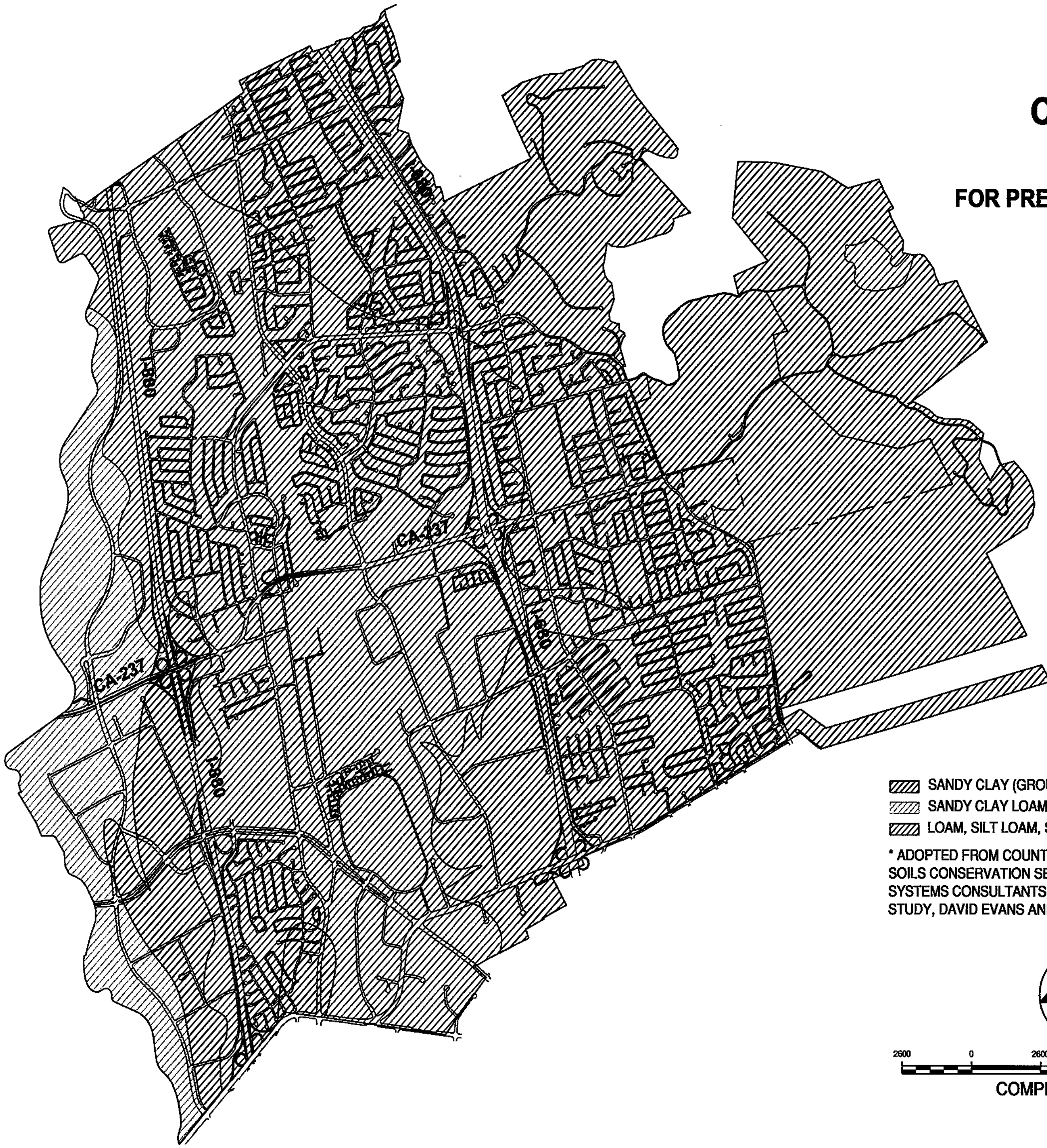
SOILS MAP

Request from City staff

APPENDIX A

CITY OF MILPITAS SOILS MAP*

FOR PRELIMINARY LEVEL IDENTIFICATION



SANDY CLAY (GROUP D)

SANDY CLAY LOAM (GROUP C)

LOAM, SILT LOAM, SANDY CLAY LOAM (GROUP B/C)

* ADOPTED FROM COUNTY OF SANTA CLARA SOILS MAP, U.S.D.A SOILS CONSERVATION SERVICE 1968, AS CITED BY EARTH SYSTEMS CONSULTANTS, CITY OF MILPITAS SEISMIC ISOLATION STUDY, DAVID EVANS AND ASSOCIATES, JANUARY 2002.

2600 0 2600 5200 7800 10400

COMPILED MAY 2003

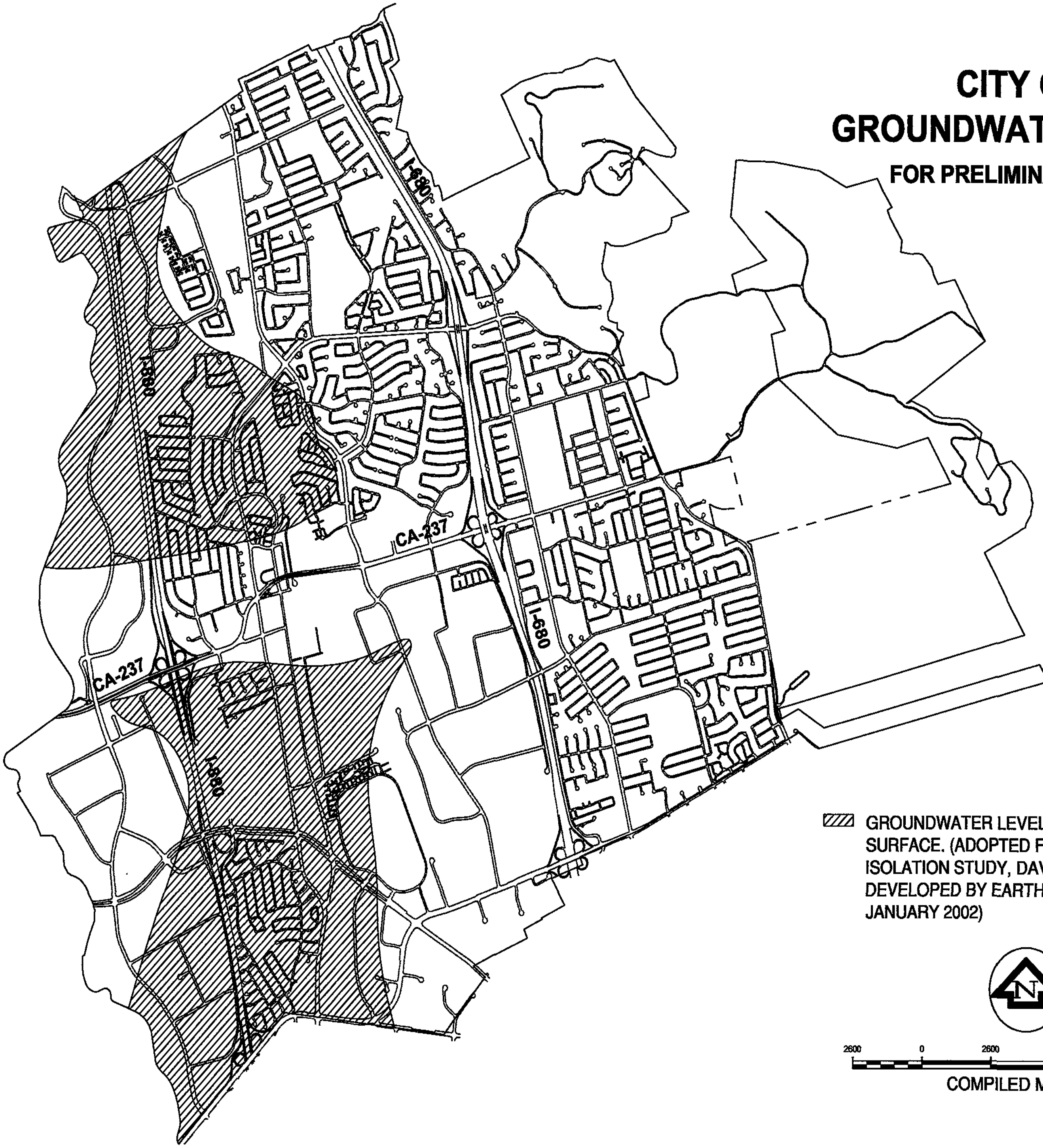
APPENDIX B

GROUNDWATER ELEVATION MAP

Request from City staff

CITY OF MILPITAS
GROUNDWATER ELEVATION MAP

FOR PRELIMINARY LEVEL IDENTIFICATION



GROUNDWATER LEVEL LESS THAN 10 FEET BELOW SURFACE. (ADOPTED FROM CITY OF MILPITAS SEISMIC ISOLATION STUDY, DAVID EVANS & ASSOCIATES, AS DEVELOPED BY EARTH SYSTEMS CONSULTANTS, JANUARY 2002)

2600 0 2600 5200 7800 10400

COMPILED MAY 2003

APPENDIX C

SOURCES AND SOURCE CONTROL BMPs

APPENDIX C

SOURCES OF RUNOFF POLLUTANTS AND SOURCE CONTROL BMPs

	Potential Sources of Runoff Pollutants	Minimum Permanent (structural) Source Control BMPs	Operational BMPs
❑	A. Illegal dumping to on-site storm drain inlets	Mark all inlets with the words "No Dumping! Flows to Bay" or similar.	Prohibit tenants/occupants from discharging any wastewater to storm drains or to store or deposit materials so as to create a potential discharge to storm drains.
❑	B. Interior floor drains and elevator shaft sump pumps	Plumb to sanitary sewer system and not to storm drains.	
❑	C. Interior parking garages	Plumb all parking garage floor drains to sanitary sewer.	
❑	D1. Indoor and structural pest control	Design structure to discourage entry of pests into buildings.	
❑	D2. Landscape	Retain existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, promote surface infiltration where appropriate, and minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plans appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping with minimal pesticide use. See "Landscape Maintenance Techniques for Pest Reduction" fact sheet.
❑	E. Pools, spas, and decorative fountains.	No direct connections to sanitary or storm drains. Locate sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	Observe BMPs for pool maintenance.

APPENDIX C

SOURCES OF RUNOFF POLLUTANTS AND SOURCE CONTROL BMPs

	Potential Sources of Runoff Pollutants	Minimum Permanent (structural) Source Control BMPs	Operational BMPs
☐	F. Food service equipment cleaning	Restaurants, grocery stores, and other food service operations shall be equipped with a floor sink or other area for cleaning floor mats, containers, and equipment, connected to a grease interceptor before discharging to the sanitary sewer. Cleaning area shall be indoors or in a covered area outdoors and shall be large enough to accommodate mats and equipment used in the facility.	See BMP brochure for restaurants and grocery stores.
☐	G. Refuse areas	If dumpsters or other receptacles are outdoors, grade and pave designated area to prevent run-on to the area and berm to prevent runoff from the area. Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site.
☐	H. Industrial processes.	All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.	
☐	I. Outdoor equipment or materials storage.	Outdoor storage areas to be covered. Grade and berm areas to prevent run-on or run-off from area. Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. Storage of hazardous materials and wastes must be in compliance with the City's hazardous materials ordinance and a Hazardous Materials Management Plan for the site. Catch basin valve inserts may be used; installations subject to Fire Department review.	See brochure for industrial/commercial BMPs.

APPENDIX C

SOURCES OF RUNOFF POLLUTANTS AND SOURCE CONTROL BMPs

	Potential Sources of Runoff Pollutants	Minimum Permanent (structural) Source Control BMPs	Operational BMPs
☐	J. Vehicle and Equipment Cleaning	(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Apartment complexes shall have a paved, bermed, and covered car wash area or else shall prohibit car washing on-site and use an automatic shut-off on hoses to discourage such use. (3) Vehicle/equipment washing areas shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Car dealerships and similar may rinse cars with water only.
☐	K. Vehicle/Equipment Repair and Maintenance	(1) Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. (2) Secondary containment shall be provided for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. (3) Vehicle service facilities shall not contain floor drains unless the floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer, for which an industrial waste discharge permit has been obtained. (4) *Tanks, containers or sinks used for parts cleaning or rinsing shall not* be connected to the storm drain system. Tanks, containers or sinks used for such purposes may only be connected to the sanitary sewer system if allowed by an industrial waste discharge permit.	No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

APPENDIX C

SOURCES OF RUNOFF POLLUTANTS AND SOURCE CONTROL BMPs

	Potential Sources of Runoff Pollutants	Minimum Permanent (structural) Source Control BMPs	Operational BMPs
❑	L. Fuel Dispensing Areas	(1) Fueling areas[1] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. (2) Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area, as defined below1.] The canopy [or cover] shall not drain onto the fueling area.	The property owner shall dry sweep the fueling area routinely.
❑	M. Loading Docks	Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. Door skirts between the trailers and the building shall be installed to prevent exposure of loading activities to rain.	See "Industrial/Commercial BMPs"
❑	N. Fire Sprinkler Test Water	Sanitary sewer connections shall be provided to drain fire sprinkler test water.	

[1] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

APPENDIX C

SOURCES OF RUNOFF POLLUTANTS AND SOURCE CONTROL BMPs

	Potential Sources of Runoff Pollutants	Minimum Permanent (structural) Source Control BMPs	Operational BMPs
❑	O. Miscellaneous Drain or Wash Water	Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Rooftop equipment shall drain to the sanitary sewer. Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
❑	P. Plazas, sidewalks, and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and shall not be discharged to a storm drain.

APPENDIX D

EXAMPLE STORMWATER CONTROL PLANS

STORMWATER CONTROL PLAN
For
SOUTH MAIN MANOR
124 South Main Street
Milpitas, CA

APN: 86-27-23

PROJECT SETTING

Site Features. The project is a mixed-use, transit-oriented, zero-lot-line development on a flat infill site. There are ten residential units, 1339 square feet of first-floor retail space, and 2,217 square feet of second-floor office space. Total lot area is 16,818 square feet. Ground-floor landscaping is limited to streetscape planter boxes.

The project is designed with podium parking. Access is from South Main Street. Residential units and offices are set on a second-story-level landscaped plaza.

Opportunities and Constraints. Because of the project's small size and 100% lot coverage, stormwater infiltration is not an option. The lack of ground-floor landscaping limits opportunities to integrate stormwater detention into the project. However, because all of the project's impervious area is at the second-floor plaza level or the roofs above, it is possible to route drainage from the rooftops and plaza to above-ground BMPs at lower levels.

MEASURES TO LIMIT IMPERVIOUSNESS

Site Design Features. This "smart growth" project contributes to City and regional goals to reduce sprawl and limit urban imperviousness. The high-density, mixed-use, transit-oriented nature of the project contributes to regional efforts to reduce automobile use, which is a primary cause of imperviousness and urban runoff pollutants. Indoor parking effectively eliminates the most significant source of imperviousness and urban runoff pollutants.

Measures to Limit Directly Connected Impervious Area. Although the project features 100% lot coverage, two bioretention areas, totaling 423 square feet, have been incorporated into the building. These bioretention areas treat runoff from the plaza and portions of the roofs above, and are also counted as "self-retaining" areas.

Pervious and Self-Retaining Areas. There are no pervious pavements on the site. Other than the two bioretention areas and other BMPs, there are no self-retaining landscaped areas.

SELECTION AND PRELIMINARY DESIGN OF TREATMENT BMPs

Overview – Roofs. Runoff from the roof areas will be treated in BMPs located at the second-floor plaza level. Roof gutters will capture the runoff as it flows off the roofs; downspouts and pipes will convey it to one of several BMPs. Where more than one BMP is used to treat runoff from a single roof, that roof's drainage will be divided by carefully setting a high point in the slope of the roof gutter. Drainage from the flat roof of Building 1 will be divided by locating small berms in the roofing material.

The division of the roof areas and the corresponding square footage is shown in Figure 1, "Impervious Areas."

Overview – Plaza. Drainage from the plaza will be divided by locating a grade break on either side of Building 3. Runoff from each of these areas will drain as sheet flow into bioretention areas located just below the grade of the plaza. The location of the grade break and the bioretention areas is shown in Figure 1.

Locations of BMPs

The location of the BMPs is shown in Figure 2. The BMPs are designated as follows:

- SPS1 and SPS2 are stormwater planters on the South Main Street frontage. They will receive runoff from areas BG1N1 and BG1N2, respectively, and will be constructed similar to the attached design detail (Figure 3).
- SP2 is a stormwater planter at the plaza level on the south side of Building 2. It will receive runoff from Building 2. It will be constructed similar to the design detail in Figure 3.
- SP3SW is a stormwater planter at the plaza level on the south side of Building 3. It will receive runoff from area BG3NW. Runoff will be piped around from the north side gutter to the south side of the building. SP3SW will be constructed similar to the design detail in Figure 3.
- SP3SE is similar in all respects to SP3SW. It will receive runoff from area BG3NE.
- SP3SC is a larger stormwater planter that will receive runoff from the south-facing roof of Building 3 (area BG3S). It will be constructed similar to the design detail in Figure 3.
- SP4S is a stormwater planter that will receive runoff from area BG4S. It will be constructed similar to the design detail in Figure 3.
- BIO-1 is a bioretention area that will be integrated into a landscaped area at the plaza level. It will receive runoff from part of the plaza (area Plaza1) and from part of the roof of Building 1 (area BG1S). The top of BIO-1 will be 12 inches below the surface of the plaza to allow for detention storage. BIO-1 will be constructed with 2 feet of sandy loam topsoil above 1 foot or more of pea gravel or drain rock. A perforated pipe underdrain will pipe treated runoff to the storm drain system.
- BIO2 is similar to BIO-1. It will receive runoff from the remainder of the plaza (area Plaza2) and from part of the roof of Building 4 (area BG4N).

Summary of Pervious and Impervious Areas and Treatment BMPs

The attached spreadsheet includes Tables 1 and 2. An electronic copy of the spreadsheet is submitted with this Stormwater Control Plan.

Table 1 lists self-retaining areas BIO-1 and BIO-2, totaling 520 square feet.

Table 2 accounts for the remaining area on the site, all of which is impervious. All areas are effectively "disconnected" from the drainage system by being routed to BMPs that detain and retain runoff from the stormwater quality design storm. This has been accomplished by applying the designated sizing factors for the stormwater planter and bioretention BMPs to determine the minimum surface area of each BMP. Each BMP has been designed to be larger than the minimum surface area.

SOURCE CONTROL MEASURES

The site has no potential outdoor work areas, and parking is indoors. Commercial activities are limited to office and retail compatible with the residences. Therefore there are few potential sources of runoff pollutants. Sources and associated source control BMPs are in Table 3.

SUMMARY OF PERMITTING AND CODE COMPLIANCE ISSUES

The two bioretention areas are located between the first and second floor levels and must be integrated into the building structure. The City of Milpitas Building Department will be consulted regarding any special requirements prior to final design.

BMP MAINTENANCE PLAN

The selected BMPs require minimum maintenance similar to that for any landscaped area. Specific requirements are:

- Stormwater planters and bioretention areas will be irrigated throughout the dry season. Irrigation will be of sufficient quantity and frequency to allow plants to thrive.
- Landscape maintenance will minimize the use of pesticides. See the Property Maintenance Fact Sheet, "Landscape Maintenance Techniques *for Pesticide Reduction.*"
- Plants will be selected and replaced, and soils will be amended, as necessary to maintain soil structure and permeability throughout the stormwater planter and bioretention areas. General landscape maintenance, including pruning and cleanup, will be sufficient to insure that the BMPs are attractive and do not create a nuisance.

A BMP Operation and Maintenance Agreement between the City and the applicant will include a BMP maintenance plan and will be negotiated at the time of building permit application.

City of Milpitas

Stormwater C3 Compliance Detention, Retention, and BMP Sizing Worksheet

See Stormwater C.3. Compliance Handbook Chapter 5 for Instructions

Information from Planning and Zoning Application

Project Name South Main Manor
Address/Location 124 South Main Street **Assessor's Parcel Number** 86-27-33
Applicant Name Raymond and Sylvia Leung
Applicant Address 47588 Wabana Common, Fremont 94539
Phone **Fax** **Email**

Use a separate sheet for each catchment area **Total Area of this Catchment:** 16818

Table 1. Pervious Areas

Area ID	Surface	Size (square feet) Self-retaining	Non-self retaining	Runoff factor "C"	Size * C
BIO-1	LS/Bioret.	350			
BIO-2	Bioret.	170			
Totals		520	0		0

Runoff factors for non-self-retaining pervious

Surface	"C"
Turf	0.2
Landscape	0.2
Crushed aggregate	0.15
Pervious Concrete	0.1
Pervious Asphalt	0.1

Table 2. Impervious Areas

Area ID	Surface	Area Size (SF)	BMP ID	Area Served by BMP	Sizing Factor	Minimum Surface Area	Surface Area as designed
BG1N1	Roof	950	SPS1	950	0.045	43	45
BG1N2	Roof	950	SPS2	950	0.045	43	45
BG1S	Roof	656					
Plaza1	Paved	5500	Bio-1	6156	0.045	277	300
BG2	Roof	1708	SP2	1708	0.045	77	140
BG3NE	Roof	600	SP3SE	600	0.045	27	30
BG3NW	Roof	600	SP3SW	600	0.045	27	30
BG3S	Roof	1208	SP3SC	1208	0.045	54	63
BG4S	Roof	850	SP4S	850	0.045	38	39
BG4N	Roof	850					
Plaza2	Pavement	2,400	Bio-2	3250	0.045	146	171
				0			
				0			
				0			
				0			
				0			
Total		16272		16272			

Sizing Factors

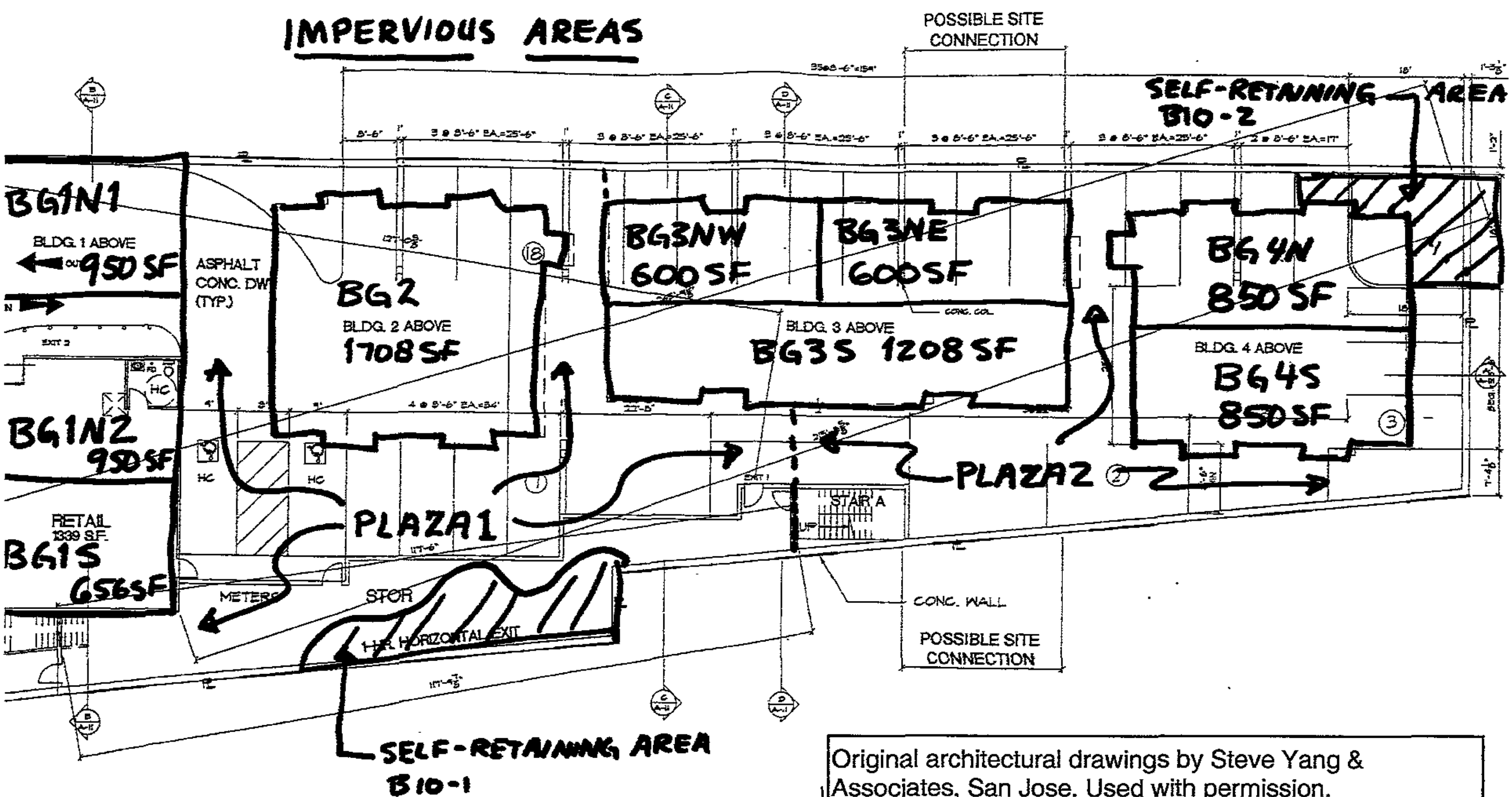
BMP	Factor
Landscape Swale	0.050
Vegetative Filter	0.065
Stormwater Planter	0.045
Bioretention	0.045
Sand Filter	0.045

Summary

Total self-retaining Area	520
Total Area Served by Integrated/Distributed BMPs	16,272
Total Disconnected Area	16,792
Total Area in Catchment	16,818
Remaining Area to be Served by Structural BMPs	**26**

Table 3. Potential Sources of Runoff Pollutants and Source Control BMPs.

Potential Source	BMP
Illegal dumping.	There are no storm drain inlets on site.
Interior floor drains.	Interior floor drains to be plumbed to the sanitary system.
Parking lots	Floor drains to be plumbed to the sanitary system via a device approved by the Water Pollution Control Plant
Pesticide/fertilizer application	Instructions on pesticide and fertilizer use to be incorporated into agreement for O&M of treatment BMPs.
Fountain on plaza.	Provide sanitary clean-out for discharge of fountain water for cleaning.
Food service facilities.	No food service facilities planned on site. If added at a future date, required BMPs should be incorporated into permit approvals at that time.
Refuse areas.	Refuse is to be stored inside and removed to South Main Street only for pickup.
Litter and food waste on plaza	Regular pickup and cleaning by building maintenance. Plaza runoff is treated in bioretention areas.
Litter on South Main Street frontage.	Regular pickup and sweeping by building maintenance.



Original architectural drawings by Steve Yang & Associates, San Jose. Used with permission.

Figure 1. Designation of Impervious Areas

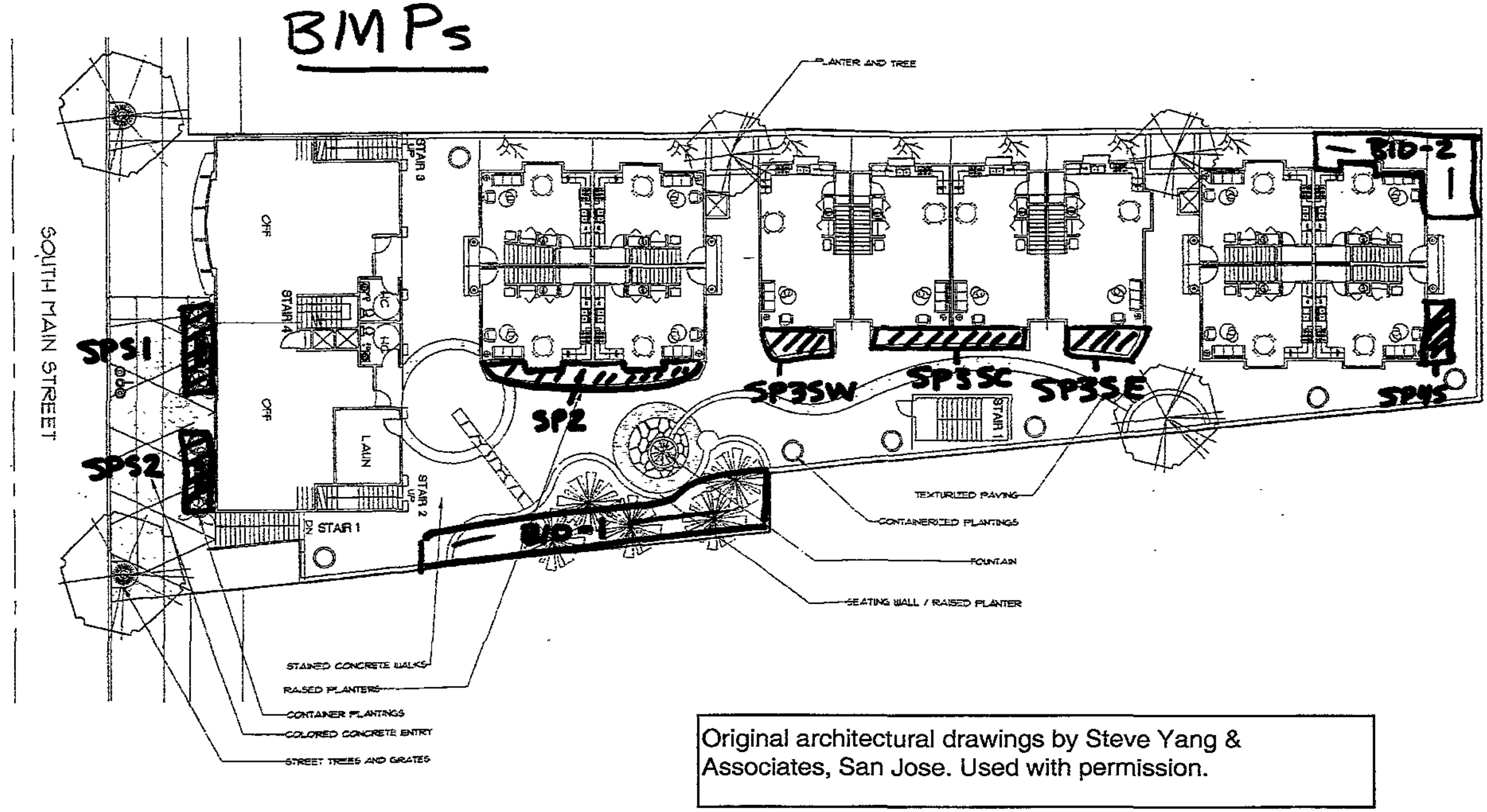
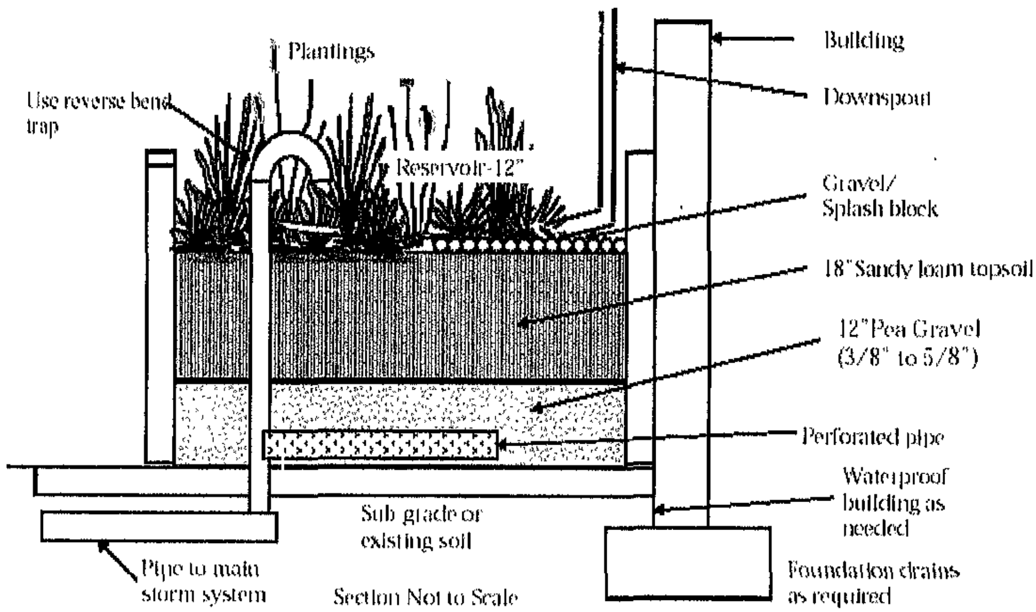


Figure 2. Locations of BMPs

Figure 3.

▶ STORMWATER PLANTER



Can be used in any soil type (A,B,C,D). Can be used adjacent to building and within setback area.
Minimum width: 18".
Minimum length: none.
May be constructed of wood (but not treated wood that may leach toxic chemicals), concrete, stone, or other durable material.
Irrigation required to maintain plant viability.

Drawing courtesy City of Portland, OR.

APPENDIX E

DETENTION, RETENTION, AND BMP SIZING WORKSHEET

City of Milpitas

Stormwater C3 Compliance Detention, Retention, and BMP Sizing Worksheet

See Stormwater C.3. Compliance Handbook Chapter 5 for Instructions

Information from Planning and Zoning Application

Project Name

Address/Location **Assessor's Parcel Number**

Applicant Name

Applicant Address

Phone **Fax** **Email**

Information from NPDES Permit Provision C3 Impervious Surface Data Form

Project Site Size (sq. ft.)

Existing impervious surface area (sq. ft.)

New impervious surface to be replaced (sq. ft.)

New impervious surface to be added (sq. ft.)

New total impervious surface area (sq. ft.)

Use a separate sheet for each catchment area **Total Area of this Catchment:**

Table 1. Pervious Areas

Area ID	Surface	Size (square feet) Self-retaining	Non-self retaining	Runoff factor "C"	Size * C
Totals		0	0		0

Runoff factors for non-self-retaining pervious areas

Surface	"C"
Turf	0.2
Landscape	0.2
Crushed aggregate	0.15
Pervious Concrete	0.1
Pervious Asphalt	0.1

Table 2. Impervious Areas

Area ID	Surface	Size (square feet)	BMP to be used	Sizing Factor	Minimum Surface Area	Surface Area as designed
Total		0				

Sizing Factors

BMP	Factor
Landscape Swale	0.045
Vegetative Filter	0.045
Stormwater Planter	0.045
Bioretention	0.045
Sand Filter	0.045

Total Area Served by Integrated/Distributed BMPs	0
Remaining DCIA not Served by Integrated/Distributed BMPs	0
Total Remaining Connected Area in This Catchment	0

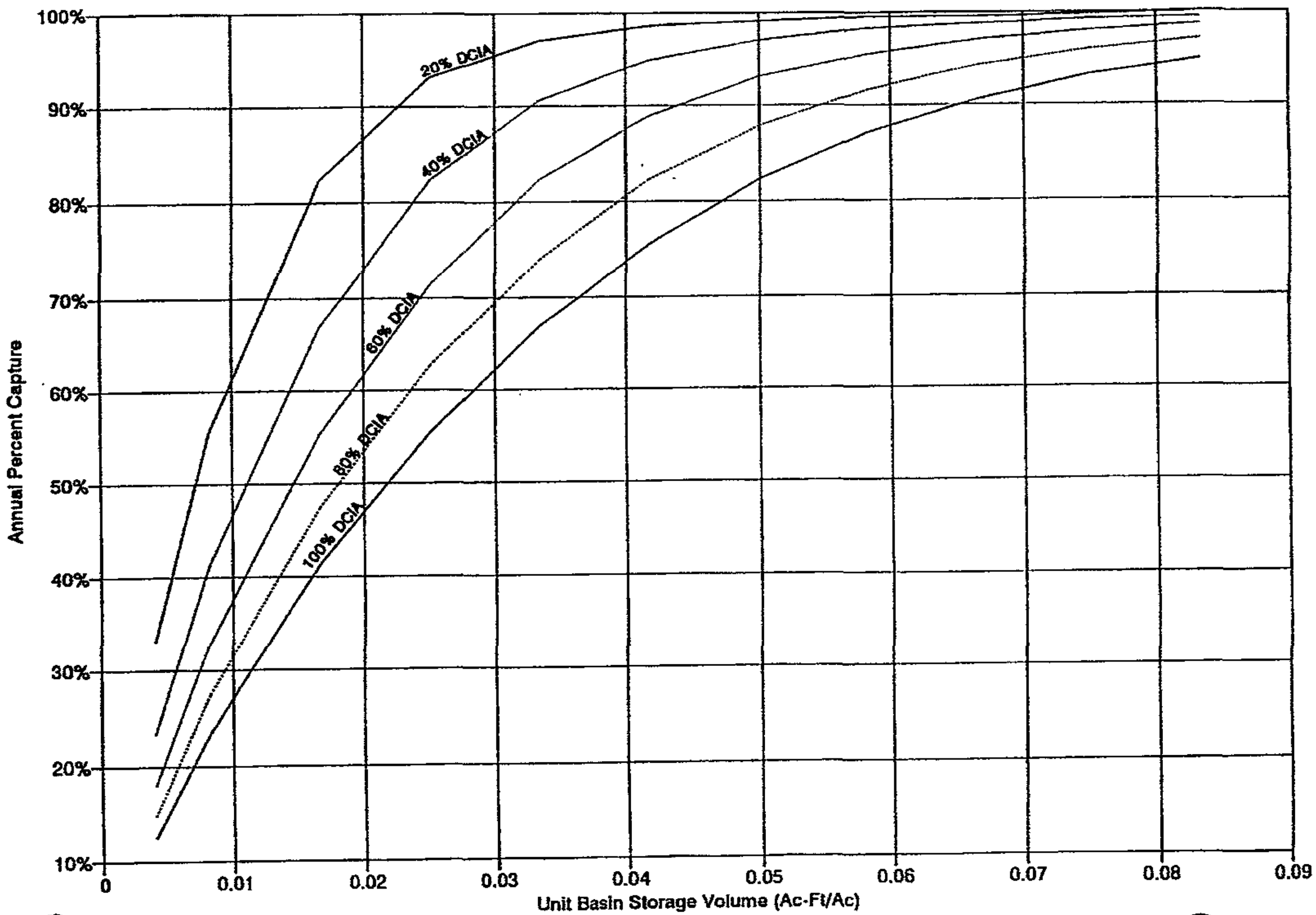
Structural BMP Water Quality Volume (California BMP Method)	
Percent remaining directly connected impervious area	#DIV/0!
Enter unit basin storage volume (from nomograph)	0.04
Water Quality Volume (cubic feet)	0

Structural BMP Design Flow Rate	
Runoff factor for non-self-retaining area	#DIV/0!
Design Rainfall Intensity (inches/hour)	0.2
Design Flow Peak Rate (cubic feet/hour)	#DIV/0!

APPENDIX F

CALIFORNIA BMP METHOD SIZING NOMOGRAPH

Oakland WSO Airport
40 Hour Detention Storage Analysis



APPENDIX G

BUILDING DEPARTMENT REQUIREMENTS FOR TREATMENT BMPs

[Placeholder]

APPENDIX H

CITY OF MILPITAS
STORMWATER CONTROL OPERATION AND MAINTENANCE VERIFICATION PROGRAM

[Placeholder]

APPENDIX I

EXAMPLE STORMWATER CONTROL OPERATION AND MAINTENANCE PLANS

[Placeholder]